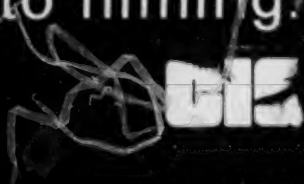


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INTERNATIONAL ENVIRONMENTAL AGENDA FOR THE 101st CONGRESS

HEARING OF THE COMMITTEE ON FOREIGN RELATIONS UNITED STATES SENATE ONE HUNDRED FIRST CONGRESS FIRST SESSION

APRIL 20, 1989

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INTERNATIONAL ENVIRONMENTAL AGENDA FOR THE 101st CONGRESS

THURSDAY, APRIL 20, 1989

U.S. SENATE,
COMMITTEE ON FOREIGN RELATIONS,
Washington, DC.

The committee met at 10:04 a.m., in Room SD-419, Dirksen Senate Office Building, Hon. Claiborne Pell (chairman of the committee) presiding.

Present: Senators Pell, Helms, and Pressler.

The CHAIRMAN. The Committee on Foreign Relations will come to order.

Today our committee will begin hearings on legislative initiatives, possible ones, in the area of the international environment. These hearings will cover such threatening problems as global warming, tropical deforestation, loss of biological diversity, and pollution of the natural and human environment in developing nations.

These hearings are different from those we have held in the past and from those being held by other committees. Our purpose is not just to highly a growing crisis, although the crisis nature of our global environment certainly needs emphasis, but rather to develop a concrete plan of legislative action. I have asked our panelists to focus their testimony on specific legislative initiatives that might be undertaken.

Our witnesses today are exceptionally well qualified to undertake this task. For many years they have been profits of the international environmental movement. Russell Train is the president of the World Wildlife Fund and was the first administrator of EPA. Gus Speth is president of the World Resources Institute. These two witnesses have been active in the development of international environmental legislation, and both have the kind of practical action-oriented approach so urgently needed.

I would also like to welcome Dr. Fred Singer and Dr. Patrick Michaels of the Department of Environmental Sciences at the University of Virginia. They have been lively writers on some of these issues. I look forward to hearing their testimony too.

In years past it has often been a somewhat lonely struggle to focus the attention of legislators and environmentalists on the international dimension of the environmental problem. We have all focused on the national dimensions of it, but we have tended to skip or leapfrog over the international sides of it. I well recall that some of my own early initiatives, such as the treaty banning the

use of environmental modification techniques in warfare, or the legislation setting up a program to protect biological diversity, or the treaty prohibiting the emplacement of weapons of mass destruction on the seabed floor. All of those treaties were considered esoteric. They are all now written down and on the books and, in effect, I think of great significance for the future.

Last year's drought and the concern that it was a harbinger of global warming has helped change our perspective on the environment and made these considerations seem less esoteric. As a result, the 101st Congress opens with unprecedented interest in the international environment as reflected in the number of bills introduced or in preparation to address this issue. So, I hope to capitalize on this interest through this hearing today and subsequent development of legislation.

I know how much I welcome the testimony of the witnesses we have today, and I would now turn to the ranking minority member. [The prepared statement of Senator Pell follows:]

PREPARED STATEMENT OF SENATOR PELL

Today, the Committee on Foreign Relations will begin hearings on possible legislative initiatives in the area of the international environment. These hearings will cover such threatening problems as global warming, tropical deforestation, loss of biological diversity, and pollution of the natural and human environment in developing countries.

These hearings are different from those we have held in the past and from those being held by other committees. Our purpose is not merely to highlight a growing crisis—although the crisis nature of our global environment certainly needs emphasis—but rather to develop a concrete plan of legislative action. I have therefore asked our panelists to focus their testimony on specific legislative initiatives that might be undertaken.

Our witnesses today are exceptionally well-qualified to undertake this task. For many years they have been prophets of the international environmental movement. Russell Train is the president of the World Wildlife Fund and was the first Administrator of the Environmental Protection Agency. Gus Speth is president of the World Resources Institute. These two witnesses have been active in the development of international environmental legislation and both have the kind of practical, action-oriented approach that is so urgently needed. At a later stage, the committee will hear from the administration on the initiatives that I hope to see come out of this hearing.

I would also like to welcome Dr. Fred Singer and Dr. Patrick Michaels of the Department of Environmental Sciences at the University of Virginia. They have been lively writers on some of these issues and we will look forward to hearing their testimony after Messrs. Train and Speth.

In years past it has been a sometimes lonely struggle to focus the attention of legislators and environmentalists on the international dimension of the environmental problem. I well recall that some of my earlier initiatives—such as the treaty banning the use of environmental modification techniques in warfare or the legislation setting up a program to protect biological diversity—were considered esoteric.

Last year's drought—and the concern that it was a harbinger of global warming—has helped change our perspective on the environment. There is a growing awareness among legislators and environmentalists of the global nature of our environmental crisis. As a result, the 101st Congress opens with unprecedented interest in the international environment, as reflected in the number of bills introduced or in preparation that address this issue. It is my hope to capitalize on this interest through these hearings and subsequent development of legislation. I therefore very much look forward to your testimony and to your ideas.

Senator HELMS. Mr. Chairman, thank you very much. I have no opening statement. I am interested in hearing from the distinguished witnesses, though.

The CHAIRMAN. Russell Train is scheduled to be first. He has just magically come through the door. So, maybe he will come right on up, and Gus Speth, if the two of you would sit there.

Senator HELMS. Mr. Train, don't worry about it. I always identify myself as the late Jesse Helms because I'm always a dollar short and 5 minutes late. [Laughter.]

The CHAIRMAN. I think if Mr. Train is ready to go, we would go with you. If you have a statement there, the full text of it can be inserted in the record.

Mr. TRAIN. Thank you, Mr. Chairman. I will summarize.

The CHAIRMAN. Thank you.

Mr. TRAIN. And I do apologize for being late.

The CHAIRMAN. I'm delighted you're here.

STATEMENT OF HON. RUSSELL TRAIN, PRESIDENT, WORLD WILDLIFE FUND, WASHINGTON, DC

Mr. TRAIN. Mr. Chairman and distinguished members of the committee, thank you for this opportunity to appear and testify on international environmental priorities for the 101st Congress.

Your hearing, I might say, is extremely timely. The Earth faces a daunting array of environmental and natural resource problems, the solutions to which require major, long-term commitments on the part of the United States and, indeed, on the part of the entire community of nations. The Congress and this committee have crucial roles to play if we are to meet these commitments.

Of course, the emphasis I urge here on international environmental problems is not intended in any way to divert attention or funding from domestic environmental needs. The most important contribution any nation can make to solving global environmental problems is to put and keep its own environmental house in order, and my recommendations include domestic as well as international suggestions. Certainly the Alaskan oilspill of recent—I was about to say memory—it is not memory yet, unfortunately. The Alaskan oilspill underlies the importance that I attach to keeping our own environmental house in order as a major contribution to the international environment.

Let me state at the outset, as I have on previous occasions before this committee, that in my opinion, global environmental problems inevitably will become the principal focus of international affairs. The single overriding long-term issues facing the world community is how to achieve and maintain a sustainable balance between growing human populations and the natural systems of the Earth upon which all life and all human activity depend.

It is hard to escape the conclusion that the imbalance between human populations and their resource base is growing greater all the time. Global warming and the ozone layer depletion are a growing threat. Rampant deforestation, eroding soil, spreading deserts, loss of biological diversity, including the destruction of fisheries, and polluted and degraded urban environments, combined with rapid population growth, present a picture of spreading environmental impoverishment, particularly in the tropics where the preponderance of human population growth is taking place. And these problems are getting worse rather than better.

It is important to recognize that environmental degradation and human poverty are closely linked. Impoverished people, desperate for land on which to grow crops or graze cattle and desperate for firewood, are destroying forests and overgrazing ever more marginal land. I do not present this gloomy picture in order to be discouraging, but rather to emphasize the urgency of addressing environmental problems now. Thus, once again, I say this hearing is extremely timely.

What international environmental priorities can this Congress address, and how specifically can it address them?

By my reckoning, the 101st Congress has about 18 months to go, taking recesses and all the recesses into account. It doesn't leave much time. I will therefore focus my remarks on what the 101st Congress can do for the international environment so that we can look back in 18 months from now and say this Congress made a difference. I have a list of 10 specific proposals which I believe are a practical, workable set of concrete actions which together form a congressional agenda which provides a springboard for the environmental work ahead of Congress, the executive branch, and the world community.

The legal framework for dealing with international environmental issues must be extended and reinforced over the next decade, and I am confident it will be. I think it is safe to predict that the treaties, conventions and bilateral agreements pertaining to environment and natural resources will undergo profound change between now and the end of the century.

World Wildlife Fund and the Conservation Foundation believe that a sound, international, legal framework to protect the environment is in place today, and Congress is key to fulfilling the potential of those instruments and institutions that already exist.

Thus, my first three items for the 101st Congress are, one, double the U.S. contribution to the United Nations Environment Program, UNEP, from \$9.5 to \$20 million for fiscal year 1990 and retain that level for 1992. UNEP clearly came into its own by skillfully steering the Montreal protocol through scientific uncertainty and political mistrust to almost landmark diplomatic achievement. UNEP has gained the trust of a wide range of parties. There is no particular magic, Mr. Chairman, in the \$20 million figure. I think the point is that I believe it deserves and requires a significant increase on the part of the United States.

UNEP is not a perfect instrument by any stretch of the imagination, and it is subject to considerable criticism. But I would emphasize what we have available, and we think it should be strengthened and improved, the best way to participate in that is to be strong players in UNEP, and I believe the kind of increased financial contribution I suggest can help support that approach.

Second, promote full funding and a permanent line item in the Federal budget for U.S. obligations under all international treaties and agreements that provide the legal framework for protecting the environment and natural resources. The Convention on International Trade and Endangered Species of Wild Fauna and Flora, referred to usually as CITES, the World Heritage Convention, the Ramsar Convention on Nature Protection and Wildlife Preserva-

tion in the Western Hemisphere should all be well funded each as a separate line item. They tend to get lost today.

Three, authorize the President to maintain U.S. membership in the International Tropical Timber Organization and provide \$5 million in fiscal year 1990 and \$10 million in fiscal year 1991 for research and development projects that foster conservation and sustainable use of tropical forests. The Congress has yet to give official consent to U.S. membership and participation in this unique organization which was formed to implement recommendations stemming from the 1985 International Tropical Timber Agreement, ITTA. This next decade must be one of urgent experimentation in sustainable tropical forestry. The ITTA is the only international commodity agreement with a conservation mandate, and excellent projects are already at ITTA but lack funding.

World Wildlife Fund and the Conservation Foundation are painfully aware that in recent years crushing debt burdens have led many countries to accelerate exploitation and exportation of natural resources, particularly tropical timber, and to promote economic policies which provide short-term economic benefits, but cause long-term damage to the environment.

We, therefore, urge the administration to fully explore any and all opportunities to consider conservation of tropical forests and other natural resources as part of the administration's plan for the international debt problem. A strong bipartisan expression of support in this regard would be useful. It would be especially useful for the Congress to urge the administration to consider ways to encourage U.S. financial institutions to participate in debt-for-nature transactions. Mr. Chairman, my full statement expands on the debt-for-nature matter at considerable length.

The World Wildlife Fund has participated and been involved in the negotiation of some \$12 million of debt swaps to date in Ecuador, Costa Rica, the Philippines, and one other which escapes my mind at the moment, and a number of others are under exploration at the present time.

And I was very gratified in his statement this past week—earlier this week that President Bush, as part of the package of aid for Poland which he has proposed, included reference to encouraging debt swaps by the private sector, both in the profit and nonprofit areas, and named environmental debt swaps specifically. And this is the first time I think that the President or any President, for that matter, has underlined the importance of this technique.

Reauthorization of the Foreign Assistance Act presents a vital opportunity for the international environment. Owing in large measure to the vigilance and oversight of this committee, the Agency for International Development, AID, has made great progress on environmental aspects of its development assistance program in recent years. WWF and CF's experience with U.S. AID in the field gives a unique perspective on measures which could be taken to improve the way in which the United States carries out its development assistance responsibilities.

But I would like once more to reiterate what I said in the earlier sentence there that I think AID has, in fact, made a great deal of progress in this area thanks to a lot of encouragement from this

committee and the Congress and organizations such as are represented here today. But they have made a lot of progress.

Congress should support measures to significantly relax rules and regulations governing small grants to local, nongovernmental organizations, NGO's, and private voluntary organizations, PVO's. U.S. development assistance should encourage local input and participation in project planning and implementation and recognize that the success of indigenous organizations depends on their flexibility to respond to changing local needs. Rigid reporting and procurement requirements severely hamper such flexibility, often to the detriment of on-the-ground conservation work. This is a small matter, Mr. Chairman, it may seem, but it is an extremely important matter in terms of the effective implementation of environmental goals in terms of our foreign assistance program.

Six, Congress should direct U.S. AID to promote improved and consistent environmental guidelines for all major development assistance donors. While many U.S. policies and procedures in the field are basically sound—and I would refer to our guidelines covering the use of pesticides and other chemicals in the foreign assistance program—many other countries that provide development assistance have poor environmental assessment and protection policies or no policies at all. This raises the issue of forum shopping where recipient countries look to donors with the fewest restrictions on their grants or technical assistance.

It is especially important that a dialog begin with Japan on such issues, for her bilateral foreign assistance is now on the scale of our own and has the same potential for good or for harm. I am submitting for the record today a WWF report on the Japanese tropical forest timber trade which finds that Japanese development aid plays a central role in encouraging unsustainable tropical timber exploitation in Southeast Asia, particularly in the Malaysian provinces of Sabah and Sarawak. I urge the United States through U.S. AID to engage the Japanese Government in a dialog to address conservation and development issues. And if I may present this document for the record, Mr. Chairman.

The CHAIRMAN. Thank you.

[The information referred to follows:]

TIMBER FROM THE SOUTH SEAS

(by Francois Nectoux and Yoichi Kuroda)
A WWF International publication, April 1989

Foreword

This report has three main objectives:

1. To analyse how and why Japan became the main importer of Southeast Asian tropical timber products, often controlling extraction and trading activities, and why such a situation will ultimately prove to be unsustainable for the Japanese wood economy, the environment and the societies who live in tropical forest regions.
2. To seek a greater understanding (by looking at the characteristics of the tropical timber trade and timber end-uses in Japan, and at Japanese development aid) of the way in which the tropical timber trade has been integrated into the Japanese economy. This in turn will aid assessment of the possible ways of adapting current trade patterns in the short term, so that tropical forests will remain an asset for future generations.
3. To consider the ways in which Japan could secure sufficient wood in the medium and long term to meet domestic needs; and how domestic demand could be modified in order to prevent the environmental and social damage associated with current forms of tropical forest exploitation.

WWF believes that measures for the long-term preservation and sustainable management of tropical forests must become necessary components of economic development co-operation. Conversely, the destruction of such environments in the long term, is likely to contribute significantly to political and economic destabilization, especially in Southeast Asia.

Throughout the report, two basic principles are followed:

1. Tropical forests are not merely timber commodity standing stocks, or land areas awaiting conversion. They also provide a home for millions of people and are the earth's most biologically diverse habitats. They are essential to regional and global environmental processes.
2. In a narrower economic context, timber represents only one part of the potential economic benefit which could be derived from the sound management of tropical forests. The problem is that the current philosophy of commercial forestry centres on wood, rather than on multi-species resources and the sustainable utilization of secondary forest products such as fruits, nuts and oils.

Most decision-makers now accept that a modified approach to the utilization of tropical forests is needed. Nearly a decade ago, warnings in the English-speaking world concerning the plight of rainforests (for instance Myers, 1980, 1981; Grainger, 1980; Plumwood and Routley, 1982), were mocked as being unduly alarmist. Yet sadly they have actually proved too conservative with regard to what has occurred, and continues to occur, in many regions.

Structure of the Report

The report is divided into three sections. The first looks at the development of Japan's tropical timber trade and its importance in global terms. The need for imported timber to meet Japan's domestic needs, the geographic origin of these imports and the form they take are also examined. In the second part, Japan's importing and trade system, and resource control and compensating mechanisms (e.g. overseas investments and aid) are examined.

After putting the problems of the Japanese wood industry into an international context, the last part of the report looks at possible courses of action for the near future. This approach is particularly relevant as it is highly unlikely that Japan will be able to continue importing tropical timber, especially logs, at its current rate. The Japanese government and its economists need to take steps now. If the present situation continues, tropical forest degradation will also continue, and ultimately create problems for Japan.

The analysis for this report was undertaken by two teams of researchers co-ordinated by Francois Nectoux. The research was carried out from two different angles: by one team inside, and one team outside, Japan. We hope that this dual perspective has kept our analysis as objective as possible and helped us to take a more global view of the problems faced by Japan and the tropical timber exporting countries.

Two reports are being published: one in English directed at an international audience, and the other in Japanese aimed at raising an awareness of the issues in Japan. These two reports are very similar. The Japanese version gives more detail concerning questions such as the use made of imported tropical timber, while the international version provides a more rounded discussion of Japan's economy. The bulk of the analysis is the same in the two reports.

In this report, volumes for timber products are, when practicable, given in roundwood equivalent (RWE). This is to aid comparison and allows one to aggregate raw material and processed materials. A problem arises, however, owing to the differences in the efficiency of raw material usage between countries. One country can for instance average 1.7m³ of logs to produce 1m³ of veneer while another may use 2.5m³.

Owing to the greater level of efficiency in Japan (ie greater than in the Southeast Asian countries from which most of Japan's tropical timber imports originate), two different sets of conversion figures have been used. For Japan's domestic demand and supply data the coefficient figures published by the Japanese Forestry Agency have been used. For other countries, the coefficients are those established by FAO's Forestry Department and the UN Economic Commission for Europe (UN/ECE). These two sets of figures are described in the appendices.

Francois Nectoux and Yoichi Kuroda
March, 1989

Acknowledgements

This study would not have been possible without the co-operation of many people, on both sides of the world.

Several JATAN volunteers, in particular Kumiko Ogawa, Maggie Suzuki, Richard Forrest, Yukio Tanaka and Jonathan Holliman, amassed numerous documents published in Japan, and translated them into English. They also conducted many interviews. Mr Yuta Harago, WWF Tropical Forests Co-ordinator in Japan, provided much support. In London, Ms Jane Rowley and Ms Geraldine Reardon - Co-ordinator at Earth Resources Research Ltd - helped considerably with the research. Jacqueline Sawyer edited the text.

The study was funded by WWF International and supervised by Chris Elicott and Adam Markham in collaboration with Nao Hasumi, Janet Barber, Bob Buschbacher, Shinichi Hirayama and Tony Long critically reviewed all, or parts of, the text. Judith Gents, Michèle Maltas and Olga Sheean-Stone helped prepare the text for publication.

Our deepest thanks should go to experts in the field who, even if they did not agree with us in all instances, freely gave their time, expertise and advice. We would particularly like to thank Dr Peter Blandon of the City of London Polytechnic, and Mr Hissanon Okada.

Finally, we would like to thank the many professionals, industrialists and officials who answered our endless questions with great patience. A list of the institutions, governmental administrations and companies visited during the course of the research, can be found in Appendix E.

The analysis and conclusions presented in this report remain the responsibility of the authors, and not WWF. We hope that these conclusions will help to accelerate the policy debate which is now, more than ever before, necessary in Japan.

Biographies

François Nectoux is French and lives in London. An economist, he holds a doctorate in International Relations from the Sorbonne University and a diploma of the Institute of Political Sciences of Paris. After teaching development economics in Algiers, he became a consultant for the Organization for Economic Co-operation and Development in Paris. He moved to London in 1979, where he specialized in resources and risk analysis as a senior researcher for Earth Resources Research Ltd; he started to work on timber trade issues in the early 1980s. Since 1988 he has been a senior lecturer in the Faculty of Management and Policy Studies at the South Bank Polytechnic in London.

Yoichi Kuroda studied Rural Sociology in the Faculty of Agriculture of the Tokyo University of Education (Tokyo Kyoiku Daigaku). From 1982 to 1985 he was a member of the Pesticide Action Group and on the research staff of the People's Research Institute for Energy and Environment in Tokyo, and worked on many pesticide issues. During 1985-86 he conducted a research tour throughout the Association of Southeast Asian Nations (ASEAN) countries. He also worked for the Consumers' Union of Japan before becoming the Co-ordinator of the Japan Tropical Forest Action Network (JATAN) in 1987. He has since co-ordinated research on the tropical timber trade, the impact of Japan's Official Development Assistance programmes on the tropical forest areas of Asia and the Amazon, and has campaigned in support of the indigenous peoples of Sarawak, Malaysia and the Amazon.

Executive Summary

Japan's Leading Role in the International Tropical Timber Trade

For nearly two decades Japan has been the world's major tropical timber importer. In 1986 alone it imported 15.7 million m³ of tropical hardwood products. This represented 29% of the world trade, equal to the amount imported by the European Community (EC) as a whole, and exceeding that imported by the USA. In 1987, this volume increased to 20.6 million m³. The value of tropical products imported into Japan in 1986 was approximately US\$2 billion, despite the fact that imports consisted mostly of cheaper unprocessed raw logs (14 million m³ in 1987). By comparison, the EC and the US each imported a greater proportion of processed timber.

Japan mainly imports tropical timber products from Southeast Asian countries. (In Japan, the region is referred to as the "South Seas".) In 1987, 96% of its tropical hardwood imports came from only three areas: Sarawak and Sabah (Malaysian states) and Papua New Guinea. The Philippines and Indonesia were major suppliers of tropical timber to Japan during the 1960s and 1970s.

There are four key reasons why Japan has been the world's major tropical timber importer for so long.

- 1 **The considerable, and often excessive timber and paper requirements of the booming Japanese economy.** In 1986, Japanese timber demand amounted to 94.5 million m³, two-thirds of which was covered by imports. Most of these imports originated from North America and the USSR, but tropical hardwood imports from Southeast Asia still amounted to 15.7 million m³ (in roundwood equivalent).
- 2 **The high cost of domestically grown timber.** Due to Japan's uneven topography, Japanese forests are not well suited to intensive commercial management. Additionally, increasing labour costs, low productivity, and Japan's complex forest ownership structure have made domestic timber non-competitive in comparison to imports.
- 3 **The availability of cheap, high quality timber from Southeast Asia.** During the 1960s and 1970s in particular, this timber was extracted from primary forest stands in the Philippines, Indonesia and Malaysia, which contained a high density of commercially valuable trees. Such tropical timber has become virtually the sole material used in Japanese plywood manufacturing. Plywood is widely used by the Japanese construction industry for low-value, wasteful end-uses such as concrete shuttering (kon-pane).
- 4 **The import of tropical hardwood logs is largely organized by the principal general trading houses, or "sogo shosha."** These companies, which are associated with the large industrial groupings at the centre of Japan's economic structure, organize imports, finance logging in the producer countries and provide credit for processing activities in Japan. They also distribute the end-products, such as plywood, in the Japanese domestic market. Japanese traders reinforced their power considerably in the 1960s and 1970s when they made direct investments in logging activities, particularly in countries such as the Philippines and Indonesia.

Serious Environmental and Socio-economic Impacts of Commercial Logging

- **The impact of the Japanese timber trade on the environment, and on the indigenous peoples of forest regions in Southeast Asia, has been largely negative.** Although commercial "forestry" alone is not the sole cause of deforestation in Southeast Asia, it does lead to forest degradation and opens up forests for deforestation by agriculturists. (Deforestation is defined here as complete conversion of forest to another land use.)
- **Forestry management systems, which could have contributed to the sustainability of commercial forestry, have been ignored or discarded in favour of wasteful short-term extractive practices.** These are undertaken in order to guarantee a quick financial return on capital-intensive operations, and to satisfy the international timber trade's growing demand for tropical timber.
- **The economic benefits of intensive commercial logging have often been minimal for the producing nations.** Governments have been unable or unwilling either to capture the considerable "rent" or surplus profit gained by the trade, or to involve local populations in commercial forestry planning and operations.
- **Forest dwellers have been forcibly removed or compelled to abandon their customary way of life and culture, as a result of commercial logging operations.**

The Changing International Context of the Japanese Tropical Timber Trade

- **In the Philippines, commercial forestry aimed at the export market has declined drastically due to the serious degradation**

of the resource base. Forest land which has been logged over by businesses associated with Japanese interests, has been cleared for cultivation by landless farmers and large-scale agricultural interests.

- * **In Indonesia, the government has banned the export of logs and more recently, of sawnwood.** Additionally, the development of a considerable domestic processing capacity has placed Indonesia at the forefront of the international plywood market. Indonesia is expected to win a significant share of Japan's domestic plywood market in the near future.
- * **Japan can expect to lose its privileged position in the Southeast Asian timber economy.** New markets in China and the Middle East are now opening up, and their demands can be expected to rise sharply. They will compete with Japan for increasingly scarce resources over the next two decades. Demand can also be expected from those tropical countries, for example Thailand and the Philippines, which have little or no commercially valuable forest of their own left, but which seek to satisfy domestic requirements.
- * **The response of the Japanese trade so far has merely been to continue those practices which have had disastrous effects on the forests of countries such as the Philippines.** Japan also continues to seize every available investment opportunity to ensure cost-effective control of the resource base. Clear-felling operations in fragile mangrove areas in order to produce pulp for paper, are the latest examples in a long line of such investments. New investments have also been made in Papua New Guinea, one of the last countries to remain open to foreign controlled logging. Japanese plywood manufacturers also recently started to import logs from the Brazilian Amazon. Now that the commercial timber resource in Southeast Asia is dwindling, Brazil is seen by the Japanese timber trade as an alternative source of supply.
- * **Japanese industry can be expected to continue using tropical timber to make plywood for as long as possible:** in other words, until the cost of importing supplies of decreasing quality has become significantly higher than that of importing alternative softwood supplies. This scenario has been confirmed by the Japanese administration itself, which has projected that Japan will be able to continue to import tropical logs for a further 20 years.
- * **Eventually, Japan will be forced to switch to temperate sources of timber.** But it appears that the Japanese wood economy is unlikely to suffer anything more than transition problems when the supply of cheap tropical timber becomes exhausted. Alternative raw material for plywood manufacturing could be imported from the northern regions of the Pacific Rim, such as Siberia, Canada and the Northwest Pacific region of the US. It is also expected that, as from the 1990s, a softwood surplus from plantations in New Zealand, Chile and Australia will "come on stream". Consumer resistance, which is currently seen as an obstacle to the use of softwood for plywood manufacturing, would almost certainly succumb to well-planned marketing strategies. Technical problems, such as they are, have been resolved already. North American plywood manufacturers are currently gearing up their manufacturing capability in anticipation of entering the Japanese market. In fact Japan has already started to import Siberian and US logs for plywood manufacturing.
- * **The gradual depletion of commercial forests in Southeast Asia will not affect Japan's security of supply.** But the geo-political consequences of continuing its "business as usual" strategy will nevertheless threaten the regional socio-political and environmental stability of Southeast Asia. The Japanese government and Japanese corporations thus have good reason to adopt more cautious and sensitive trade strategies.

Alternative Trade Practices and Government Policies

Alternative trade patterns and policies concerning tropical timber are now required from Japan. The implementation of these alternatives would reinforce Japan's international position, for example by adding further impetus to its international development and peace efforts, and helping to guarantee the long-term social and environmental stability of tropical regions. These alternatives would not jeopardize the strength of Japan's economy, nor would they require significant lifestyle changes in Japan.

Some changes would require limited modifications to domestic processing and consumption patterns in sectors such as construction. Japanese corporations would also have to modify their policies concerning forest resources and products. **In the short term they could:**

- i) **implement a "Code of Conduct" limiting imports to timber products extracted from sustainably managed logging concessions;**

ii) agree to finance long-term forestry development projects geared towards sustainable forestry (possibly channelling funds through the International Tropical Timber Organization (ITTO));

iii) develop Japan's capacity to use softwoods for plywood manufacturing as quickly as possible, and encourage construction firms to accept such materials;

iv) aid government and non-governmental organization (NGO) efforts aimed at educating and informing the general public about the plight of tropical forest environments and societies, and the need to reduce the wasteful use of tropical forest products.

However, most of the policy and trade changes rely on government policies. Some of these are concerned with domestic questions, others with international policies:

- **There is a clear need for the Japanese government to place greater emphasis on environmental perspectives and develop a coherent forestry policy.** Up to now, short-term trade requirements have taken precedence.
 - **Government services and local authorities, which are important contract buyers, have a responsibility to ensure that buying policies are sensitive to the environmental impact of tropical timber extraction.** A code of practice in this sector could help set an example to private companies and to individual consumers.
 - **Japanese government services have a great deal of experience in co-operating with the wood industry on technical development, and in providing financial support, particularly during difficult industrial restructuring periods.** This relationship could be used to help accelerate the switch to non-tropical plywood, for instance by facilitating the retooling of smaller plywood manufacturers.
 - **Tropical timber should be reserved for added-value processes and products.** The government, in consultation with industry and consumer groups could devise policies aimed at reducing wasteful practices, such as the use of tropical woods for concrete shuttering and of hardwood pulp for high quality paper.
- The Growing International Role of Japanese Development Aid Policies**
- **Japan's growing development aid programme is another facet of its activities in tropical areas.** In 1988 this programme rose to US\$8 billion – becoming the largest in the world – and is expected to grow to US\$11 billion in 1989. This growth is partly due to the strength of the yen in relation to the dollar, but in part also to the administration's desire that Japan play its international role to the full.
 - **Japanese aid goes largely to Southeast Asian countries, with Indonesia receiving the largest proportion.** There are now moves to direct a greater amount to Africa's Less Developed Countries (LDCs). As a result, the expanding Japanese aid programme could become a significant factor in the future development and conservation of the tropical environment. This is an exciting prospect which should be welcomed. However, past experience of Japanese aid suggests that the future development and implementation of this programme might not be totally satisfactory from an environmental point of view. There are several problems which will require rapid corrective action if the increase in aid funding is to be effectively used for sustainable development.
 - **There is a pressing need for implementing full and open social and environmental impact assessment (EIA) procedures – in consultation with local communities – for all Japanese aid projects.** The few impact analyses which were carried out in the past were extremely restricted in scope, and were often not open to public scrutiny.
 - **The Japanese government continues to place too much emphasis on large-scale infrastructural and industrial project funding, and too little on sustainable natural resource management projects.** Although the proportion of aid "tied" to Japanese contracting corporations has decreased, many competing industries from other developed countries still claim that parts of the aid programme are used as marketing tools for Japanese industry.
 - **Japanese aid agencies lack experienced field personnel and administrators with relevant geographical and sectoral experience.** EIA specialists, ecologists and experts such as ethnobotanists, are also desperately needed. Even more importantly, greater emphasis should be placed on tapping the experience and knowledge of local communities.

- **The funding or subsidizing of logging infrastructure in the name of aid (but in reality for the sole benefit of Japanese trading companies) should be discontinued.** Aid programmes linked with commercial logging should be based on sustainable forest management. They should also promote environmental rehabilitation and the strengthening of forestry services.
- **A strong emphasis on community development programmes, based on agroforestry and co-management of local forestry resources, would favour environmental sustainability.** This could be financed by redirecting funds away from large infrastructural schemes, and would help reduce forest clearing carried out by landless farmers after logging, which is now a most pressing problem. Aid schemes involving industrial plantations, although sometimes necessary, should be carefully assessed and concentrated in areas which have already been deforested.
- **Japan is increasingly able to play a positive role in determining the policies of international institutions such as the World Bank.** These institutions are now more conscious of the fact that development efforts should promote conservation and the sustainable use of natural resources. They nevertheless continue to fund environmentally damaging schemes such as those in the Amazon basin. The international community and local populations would benefit greatly if Japan took a firm stance on these types of projects, and proposed alternative development schemes. Neither Japan's aid agencies, nor its commercial banks, should fund projects which have been turned down by multilateral financing institutions on environmental grounds.

The best example of where this has happened in the past is the Nam Choan Dam project in Thailand. The project was postponed by the Thai government in early 1988 due to strong national and international pressure and despite the fact that detailed dam design had been funded by the Japanese aid finance body, the OECF, and completed by Japanese engineering consultants. The World Bank withdrew the project from consideration for funding due to its potentially serious impact on one of Thailand's last remaining tropical forests. The Thai government had, however, expected OECF to fund the construction of the dam on approval.

Tropical forests are the earth's main genetic reservoir. When they are destroyed, so too are precious medical, industrial, and agricultural resources. Whatever the short-term causes for deforestation (logging, conversion for agricultural and industrial development and transmigration), it is generally accepted that in the longer term, loss of tree cover will contribute to the destruction of fragile tropical soils, disruption of water cycles and climate change.

Concern is also growing for the communities, tribes and societies which have lived in tropical forests since time immemorial. Many of them are threatened due to the destruction of their environment.

Deforestation caused by humans is not a new phenomenon, nor is it limited to tropical countries. For example, Mediterranean shores have suffered environmental and economic degradation for centuries, and in some places for thousands of years, as a direct result of the destruction of forest cover. Similarly in Japan, the history of forestry reveals a record of environmental abuse followed by catastrophic floods or loss of agricultural land. But generally, in industrialized, mostly temperate regions such as Europe, the process of deforestation took place over several centuries and was accompanied by a gradual development of agricultural and land use practices, which generally transformed the environment and soils, but did not destroy them.

The situation in tropical countries is radically different. Accelerated deforestation has occurred over one or two generations. And all too often, the farming practices applied to cleared land are ill-suited to tropical soils. The result, as the Brundtland report noted, is that:

The mature tropical forests that still exist cover only 900 million hectares, out of the 1.5-1.6 billion hectares that once stood. Between 7.6 and 10 million hectares are eliminated outright each year, and at least a further 10 million hectares are grossly disrupted annually ... (WCED, 1987).

The Extent and Main Causes of Tropical Deforestation

For a long time it was impossible to estimate accurately the extent of deforestation occurring in the tropics. This was despite the fact that people had been aware of the problem – particularly in Africa – as early as the 1940s (Aubreville, 1947). Even in the 1970s and early 1980s, estimates differed widely as to the extent of forest clearance and degradation (Myers, 1980a & 1980b). It was not until the publication of FAO's first detailed global survey in 1982, that a precise view of the problem could be formulated (Lanly, 1982).

This study concluded that on average, annual clearance of tropical forests destroys 0.6% of the existing cover (the geographical extent of which is shown in Figure 1). The rate of deforestation is similar in the three main forest zones (Latin America, Africa and Southeast Asia/Pacific) although the local level of deforestation varies widely. According to FAO, a total of 7.5 million ha of closed forests, and 3.8 million ha of open tree formations are destroyed every year in the tropics. This does not include degradation which does not actually bare the ground, but which does affect large areas of forest.

It is now widely believed that many forms of forest disruption are irreversible once a certain threshold of damage has been reached. **Seemingly minor disturbances often bring with them the seeds of total destruction. For example, even well-planned logging roads open the forest to shifting cultivation.** The FAO study concluded that 4.4 million ha of closed tropical forests per year are "altered" to some degree.

However, since the publication of the FAO conclusions, new trends have emerged in some of the most threatened tropical forest areas, for example in some countries of continental Southeast Asia and the Amazon basin. Analysis of satellite data for this last area revealed that deforestation as a result of colonization by landless farmers along government-funded motorways and roads, is speeding up, and reaches far higher levels than estimated in the 1982 FAO study (Malingreau and Tucker, 1988). For 1987, forest loss in the Amazon alone has been estimated at 8 million ha. In other regions considerable areas of forest have been lost through fire. The great East Kalimantan (Borneo) fire of 1983 is thought to have resulted in the destruction of approximately 3 million ha of tropical forest and caused most damage in previously logged-over areas (Jhamtani, 1988). In other words, data from the 1982 FAO survey gives only the lower limit of deforestation and degradation.

Shifting cultivation is often identified as the prime cause of forest destruction. This is not the traditional shifting agriculture based on a sophisticated and detailed knowledge of the local environment, but that of impoverished, landless farmers who have been forced to move out of overcrowded areas in a desperate bid for survival. Their "colonization" cultivation is destructive and extracts only a few years of crops from quickly exhausted soils. Farmers are soon compelled to move on again to new areas.

These farming practices are in effect slashing the forest away, but the question of who is responsible for opening up the forests to such practices is complex. In most cases closed forests are not penetrable unless a road or another infrastructure is built first. In any case, landless farmers cannot be held responsible for the short-term survival strategies that they are forced to adopt. As many commentators have emphasized, the problem is

Figure 1 The decline of the World's Rain Forests

**Asia** (16 tropical countries)

Total tree cover: 336.5 million ha, 305.5 million ha are in closed forests, 1.82 million ha of which is cleared per year. Main causes of destruction: landless farmers practicing intense shifting cultivation, public colonization programmes, infrastructure for logging and other large scale projects, intense degradation through logging and (in continental Asia) fuelwood gathering.

Latin America (23 tropical countries)

Total tree cover: 895.7 million ha, closed forests cover 678.7 million ha, 4.12 million of which are destroyed annually. Main causes of destruction: landless farmers colonizing and practicing intense shifting cultivation; extensive cattle grazing, large scale infrastructure and industrial developments.

Africa (37 tropical countries)

Total tree cover: 703.1 million ha but only 216.6 million ha is enclosed forests, 1.33 million ha of which are destroyed each year. Main causes of destruction: shifting agriculture (often following logging) and infrastructural development. Degradation of closed forests through logging, and of open tree formations through firewood gathering.

Source: **Tropical Rainforests: A Disappearing Treasure** (Smithsonian Institution, Washington, D.C., Travelling Exhibition Service, 1988), and (Gradwohl and Greenberg, 1988)



Previous Extent of Tropical Rainforests

Current Extent of Tropical Rainforests

Activities such as infrastructure development (building of dams and roads, mining, etc.), large-scale agricultural land uses (especially cattle ranching and clearing for cash crops such as rubber, pineapples, groundnuts, etc) and logging for commercial timber, are both directly and indirectly responsible for the degradation and destruction of forests.

The Role and Importance of Commercial Logging

In an ideal world, improved versions of such management systems, coupled with careful inventory and zoning of forested areas, could ensure a long-term equilibrium between sustainable commercial forestry, community forestry, nature reserves, and community reserves in lowland areas.

Asia. In principle they are applied in Indonesia (*Selective Cutting System*, or *Tebang Pilih Indonesia*, TPI), in the Philippines (*Selective Logging System*), in Sarawak (*Liberation Thinning System*), Burma and Thailand.

In Peninsular Malaysia, the *Selective Management System* is now officially used in all provinces. But the name is misleading. It is not the trees to be cut which are selected, but the type of management and silvicultural treatment for the various zones of the natural forest under consideration. An inventory – after earmarking areas for the protection of nature, watershed/environmental protection and recreation – selects three types of zone. Some are exploited according to a uniform system (especially some remaining lowlands Dipterocarp-rich areas), but the majority are managed according to a selective system.

References : Wyatt-Smith, 1963; Mergen & Vincent, 1987; Whitmore, 1984; Thang, 1987.

Neither the highly varied tropical forest environments, nor the practices of loggers, nor the management practices of forestry departments belong to an ideal world. In Southeast Asia – the source of more than two-thirds of the tropical timber products traded in the world market – many areas are characterized by high density stands of commercially valuable species. Since the 1960s there has been a tendency to exploit them far beyond the level of sustainability, and then to convert the prime lowland forest to agricultural land.

Forests in areas such as Sabah and Sarawak for example are vastly overexploited. A recent study for the ITTO estimated that the 3 and 3.24 million ha of permanent production forests found in Sabah and Sarawak should be logged for no more than between 4.5 and 6.5 million m³ per year of logs if sustainability was to be maintained. In fact, timber extraction in these two states currently amounts to 11.7 and 11.5 million m³ respectively (Burgess, 1988).

Box Two: Tropical Forest Management in Asia

It is not possible to give an estimate of the area of forest which is genuinely under sustained yield management in Asia. Asia differs fundamentally from both Africa and America due to the fact that all the forests under concession agreements within the region are, with the exception of Papua New Guinea, at least nominally under management.

There is, however, a very great difference between theory and practice in many parts of

the region. An ITTO report identifies the need for planning and control as follows: (1) yield or coupe confined to prescribed limits; (2) orderly fellings, confined to coupe boundaries; (3) adequate residual stand; (4) residual stand protected; (5) silvicultural work carried out; (6) felling cycle followed, no re-logging between pre-determined cycles; (7) permanent roads maintained and post-felling erosion controlled; (8) unworked forest protected; and (9) working plans written and enforced. Management tends to be inadequate for items 3, 4, 5, 6, 7, 8 and 9.

But it can still be said that the most encouraging and complete theoretical system for operational management in the region is that followed in Peninsular Malaysia, where the so-called *Selective Management System* provides for stand modelling based on adequate inventory and the data from Permanent Sample Plots (PSP). Various kinds of silvicultural management can then be applied, all of which aim to produce a sustainable yield. The system has only recently come into full use and there is no certainty of its success into and after the first cutting cycle. But it contains many of the elements which are necessary to respond flexibly to the prevailing condition of the forest stand. It is intended that this system will be applied to all of the reserved production forest within the legally-constituted Permanent Forest Estate of Peninsular Malaysia.

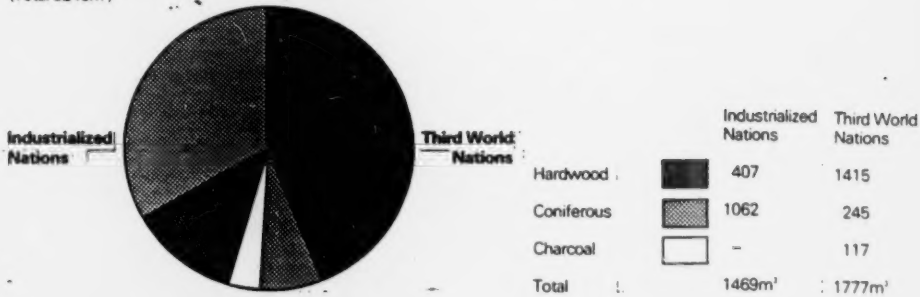
The ITTO report identified the following as "forests and operations which appear to be reasonably successful as sustained yield units": the Mae Poong forest in Malaysia; forests in Peninsular Malaysia, of which the Jengai Forest Reserve, Trengganu is one of the earliest examples; some of the operations of the Sabah Foundation; the operations of the Nasipit Lumber Co. in the Philippines and those of Padeco, Sungai Rawas, Musi River, and Sumatra in Indonesia.

Queensland, Australia

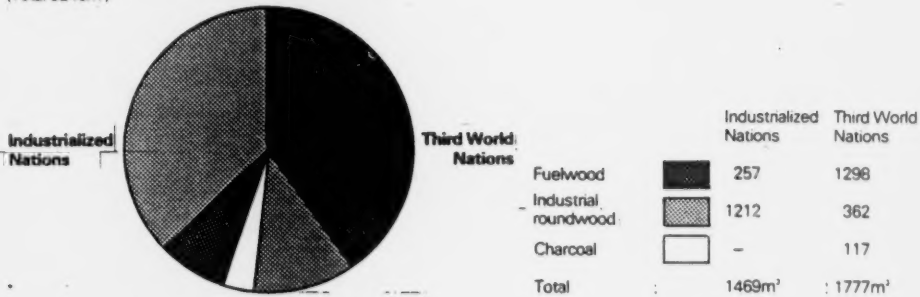
In Queensland just over 160,000ha – all the forest area scheduled for logging – was until recently under a management system for sustainable timber production. This was soundly based on research results, could respond flexibly to the condition of the forest stand and was strictly controlled. It was also subject to stringent environmental guidelines and went a long way towards ensuring that disturbance of forest-dwelling plants and animals was kept to a minimum. In spite of this, however, logging has now ceased because the Commonwealth government considered that it was inconsistent with the nomination of the Queensland rainforests as a potential World Heritage Site.

Figure 2: Removal of Wood from the World's Forests in 1986
(All figures in million m³)

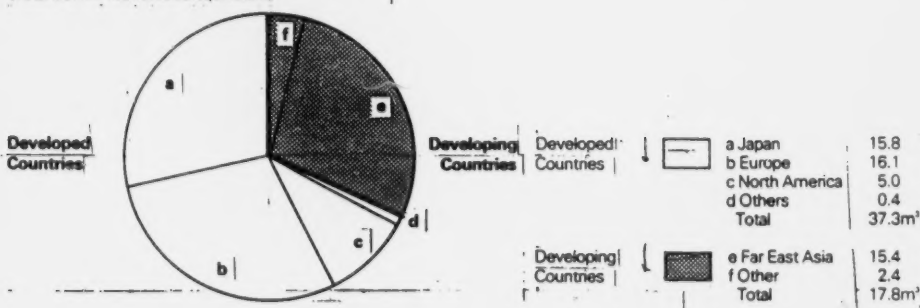
(a) Type of Wood Removed from the World's Forests
(Total 3246m³)



(b) Removal of Wood from the World's Forests by Use
(Total 3246m³)



(c) Destination of Tropical Hardwood Exports
(Total 55.1m³ roundwood equivalent)



Note: (a) Tropical hardwood includes logs, sawnwood and panels, RWE volumes. Manufactured products such as joinery and furniture are not included.

(b) To avoid double counting, exports of processed products by non-producing, tropical timber importing countries of Southeast Asia and the Far East are excluded.

Overall Picture

The area of tropical moist forest demonstrably under sustained yield management in ITTO member countries amounted, at the very most, to about 1 million ha, until the decision about Queensland reduced this by about one-fifth. (This is out of the total area of 828 million ha of productive tropical forest that were estimated to remain world-wide in 1985.)*

Urgent action is therefore required, not only to ensure the proper management of previously unlogged forest, but also to assess the status of logged forest and degraded forest lands, and to plan remedial action to bring these areas under sustainable management production as rapidly as possible. This is the remit of other pre-project studies commissioned by the ITTO.

* In 1980 the estimated total area of closed broad-leaved tropical forest was 1200 million ha, of which 860 million were productive. It was estimated that this area of productive forest would be reduced to 828 million ha by 1985 (Lanly, 1988).

(Source: Poore et al, 1988.)

In order to maximize profits, trees are removed as quickly as possible. Since the early 1950s, intensive logging has been made easier by the use of heavy equipment. This equipment is expensive, and has to be made to pay for itself as soon as possible. Loggers often borrow heavily to start the extraction process, and in order to pay back their loans quickly, extract as many trees as they can in the shortest conceivable time.

These logging practices are environmentally damaging. As noted by FAO in 1982, in the context of Southeast Asia

Logging in the Dipterocarp forests of Southeast Asia is much more intensive than in the mixed forests of tropical Africa and America. The volumes extracted, in fact, vary generally from 40 to 100m³ per hectare. The corresponding gross volume felled or damaged by this extraction is of course much higher. To this has to be added the clearing required for the opening up of access roads, which has been estimated at 14% of the area being exploited in studies carried out in Sabah and the Philippines, (two states where logging is particularly intensive). Another study in Sarawak has shown that the space that is temporarily uncovered and the soil denuded could, in total, represent up to 40% of the logged area. In this same study it was found that 26 trees in total were cut per hectare and 33 broken or damaged, these 59 trees representing approximately 40% of the growing stock. Apart from the risk of certain species disappearing, which is a risk that also exists for forests logged less intensively, this type of utilization can bring about other long

lasting consequences such as erosion and landslides in areas where the terrain is steep and the prolonged absence of vegetation regrowth on those parts of the ground that have been laid bare (Lanly, 1982).

Similar estimates of the effects in Southeast Asia of logging on remaining flora and soils can be found in many reference studies (Whitmore, 1984; US National Academy of Sciences, 1983). Types of damage frequently described include: the compaction of soils through heavy vehicle circulation; erosion resulting from the building of access and storage areas and from logging in watershed areas and on slopes which should be reserved for soil protection, and the breaking of branches, twigs, seedlings and smaller trees. Even a recent Forestry Plan for Sabah quoted destruction levels of over 40% of forest area after logging, and expressed concern over their economic effect.

It is a growing concern that heavy equipment currently used in timber extraction is causing severe damage to the forest which will affect the yield in the second cut (Sabah Forest Department, 1985).

The long-term effects of intensive logging on wildlife are difficult to assess precisely, but more details are now becoming available. Studies have shown that the number of species of trees, fauna and other flora can decrease significantly after logging, and that secondary forests are not as rich in wildlife and species diversity as primary forests (Kartawinta et al, 1981). Other studies have shown that selective logging favours the development of specific tree species requiring more light than others.

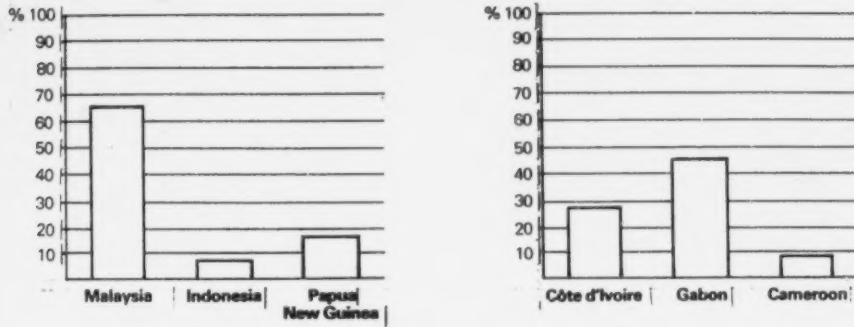
More recently, studies in Sabah (Johns, 1988) have shown that large mammals, such as elephants, are able to adapt to logging provided it is of low intensity. But logging threatens or considerably reduces the numbers of some species of birds, bats and other animals which are endemic or specially adapted to foraging in the understorey, or to specific microclimates.

However, the direct consequences of intensive logging pale into insignificance when compared with secondary effects. Forest tracks opened for log removal provide easy access to forests for landless farmers, enabling them to colonize freshly logged over forests. As noted in a UN report dealing with Southeast Asian environmental problems:

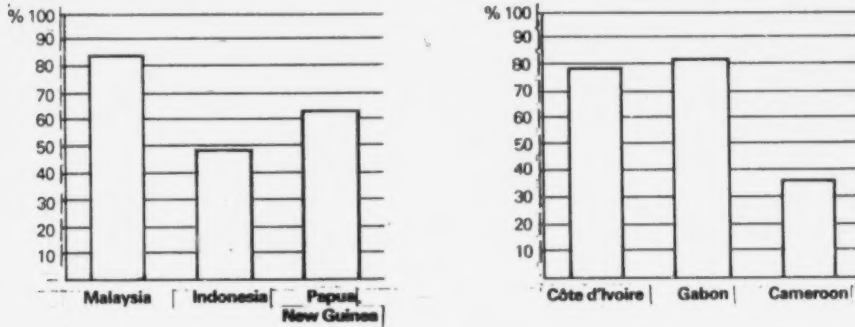
Almost all country reports stress that logging operations provide ideal paths for shifting cultivators and other farmers who follow on the heels of loggers to complete the destruction of the forest cover for agricultural purposes. **It thus seems obvious that logging, not only clearfelling but also selective logging, constitutes a major cause of tropical deforestation (ESCAP, 1986)**

Figure 3: Timber Exports as a Proportion of Total Wood Removal from Forests in 1986 – Main Tropical Exporters

(a) Timber Products (RWE) Exports as a Percentage of Roundwood (Including Fuelwood) Removals



(b) Timber Products (RWE) Exports as a Percentage of Non-fuel Timber (Industrial Roundwood) Removals



(c) Timber Products (RWE) as a Percentage of Total Exports (by Value FOB)

Country	1985	1986	1987
Indonesia	5.6%	10.4%	12.9%
Malaysia	10.8%	12.5%	13.5%
Papua New Guinea	7.8%	7.3%	
Solomon Islands	27.0%	30.6%	
Côte d'Ivoire	7.8%		
Gabon	5.5%		
Cameroon	12.6%	11.5%	

Part of the problem is that foresters and loggers recognize the issue only to the extent of putting the blame on either the settlers or governments. Too often logging is considered in complete isolation from the local economic, social and environmental contexts. Loggers have a responsibility to minimize the long-term negative socio-economic and environmental consequences of their activities. But most fail to do so and are indignant when environmental and development workers remind them of this responsibility.

Box Three: Prospects for Sustained Yield Management in Asia

Sustained yield management can be defined as the management of a forest property for continuous production, with the aim of achieving, at the earliest practicable time, an approximate balance between net growth and harvest, either annually or over somewhat longer periods.

The timber yield from forests in the individual countries of the region has fluctuated widely in the past, partly because a very large part of the production has involved liquidation of the capital of conversion forests under alienation, at least nominally, to agriculture. Log exports from the region peaked at 39.1 million m³ in 1973 and declined to 18.7 million m³ in 1982. (Exports came under increasing log export restrictions from 1981 onwards.) Sustained yield in the context of this study can only relate to the permanent production forests of the region. A comparison of these, and their approximate sustained yield potential, with the most recent timber out-turn (yield) figures is given below:

Country	Permit prod'n forests mha	Sustained yield at 1.5m ³	Prod'n at 2m ³ per ha per yr	Annual timber- production
Peninsular Malaysia	2.85	4,275,000	5,700,000	7,914,328
Sabah	3.00	4,500,000	6,000,000	11,739,262
Sarawak	3.24	4,860,000	6,480,000	11,470,000
Philippines	4.40	6,600,000	8,800,000	3,433,774
Indonesia	33.87	50,805,000	67,740,000	28,500,000
Total (m)	47.36	71,040,000	94,720,000	63,057,364

The log production from forests in the region will soon cease to consist of high-grade Dipterocarp logs with an average volume of 100 Hoppus ft, lengths of up to 35ft, and mid-girths of up to 12ft and even more. Future yield will consist of logs with maximum lengths of 16ft, diameters of about 1ft, and contain perhaps 200-300 species (there are 700 possible merchantable species in Peninsular Malaysia). Trees cut will no longer be almost free of defect.

It appears from the above table that Sabah and Sarawak are still liquidating substantial areas of forests for alienation (or overcutting the permanent forests); Peninsular Malaysia is approaching a balance, but still liquidating some forests for agriculture; the Philippines is having difficulty in finding enough workable forests to satisfy the coupe (or the productive forest area has been over-estimated); and Indonesia either has considerable scope to expand sustained production or has overestimated the extent of productive forest. (Source: Poore et al, 1988.)

The Extraction of Wood

Another means of assessing the impact of commercial forestry on tropical closed forests is to look at the amount of wood extracted from the forest, and at its various end-uses. However, in order to make this assessment, one is confronted with the problem of averaging between different uses in different areas.

For tropical countries as a whole, hardwood timber accounts for only 13.5% of the total hardwood extracted. Fuelwood and charcoal account for the remainder at around 86.5% (see Figure 2). Furthermore, the volume of tropical hardwood entering the world timber trade (see Figure 2) is very small when seen as a proportion of the total volume of hardwood extracted from tropical forests (around 3.9% in 1986, as estimated by FAO), or even as a proportion of the total commercial hardwood timber (around 23%, the rest being used locally). Obviously, the proportion of commercial and exported tropical hardwood timber would be even lower if the total quantity of wood destroyed as a result of human activities in tropical rainforests was taken into account.

In other words one could argue, and many people involved in the tropical timber trade do, that commercial logging is negligible in volume, and that its positive benefits – for example, obtaining foreign currency – far outweigh its limited environmental costs. It is true that in the case of the main timber exporting nations, commercial timber product exports account for a significant proportion of all international trade revenue. (See Figure 3c for typical examples.) Another positive benefit, at least for governments deep in foreign debt, has been the important contribution to revenue made by royalties on logging and export taxes on tropical timber exports. In Sarawak 31% of public revenue comes from the logging sector.

However, it would be naive to point to short-term financial gains (however important for government and some economic groups), as a justification for the timber booms which have taken place in some of the major tropical timber exporting countries since the 1960s. Figure 3a shows that in some

countries or states such as Malaysia, Papua New Guinea, Gabon and the Côte d'Ivoire – from which a large proportion of tropical timber originates – the total exports of timber products in volume represent an important proportion of the total volume of wood removed from the forests. Exports of timber products cannot be considered or analysed independently of the serious degradation of the resource base.

In the 1960s and 1970s development economists had a narrow approach to tropical forests which they saw solely as a commodity base. In 1972 for instance, an FAO document singled out timber production and timber-based industries:

...as of special importance in the attack on economic under-development (FAO, 1972).

Timber extraction policies have therefore often been oriented towards maximization of currency receipts. Efforts made by forestry departments to control and monitor logging have not been very successful due to a lack of funding and poor control. As a result there is little sustainable tropical forest management in operation. A recent ITTO report concluded:

The extent of tropical moist forest which is deliberately managed at an operational scale for the sustainable production of timber is, on a world scale, negligible (Poore et al, 1988).

The consequences were summarized admirably in the Brundtland report. It is interesting to note that this report was supported by the Japanese government which hailed it as a significant step in developing policy tools for protecting the environment (Environment Agency, 1987). The Brundtland report emphasized that:

Many tropical countries with large forest resources have provoked wasteful "timber booms" by assigning harvesting rights to concessionaires for royalty, rent and tax payments that are only a small fraction of the net commercial value of the timber harvest. They have compounded the damage caused by these incentives by offering only short-term leases, requiring concessionaires to begin harvesting at once, and adopting royalty systems that induce loggers to harvest only the best trees while doing enormous damage to the remainder. In response, logging entrepreneurs in several countries have leased virtually the entire productive forest area within a few years and have overexploited the resource with little concern for future productivity (while unwittingly opening it for clearing by slash-and-burn cultivators) (WCED, 1987).

Similar policy frameworks also inspired the tropical timber import practices of industrialized nations during the same period:

The promotion of tropical timber imports into certain industrial countries through low tariffs and favourable trade incentives, combined with weak domestic forest policies in tropical countries and with high costs and disincentives to harvesting in industrial countries, also drives deforestation. Some industrial countries typically import unprocessed logs either duty-free or at minimal tariff rates. This encourages developed country industries to use logs from tropical forests rather than their own, a pattern that is reinforced by domestic restrictions on the amount that can be cut in domestic forests ... (WCED, 1987).

Another consequence of the "logging boom" of the last three decades is that a number of countries previously endowed with commercially productive forests, will soon have to import supplies to meet their own domestic requirements, if they are not doing so already. Thailand already has to import wood and in fact had to do so even before its logging ban was imposed (January 1989). It is expected that Peninsular Malaysia will stop exporting timber soon. In the Philippines, plywood manufacturers are imploring the government to permit log imports since there is not enough cheap domestic timber of sufficient quality to meet domestic demand. Even Indonesian plywood mills are now importing cheaper and higher quality logs from neighbouring Sarawak (Malaysia Digest, 1988).

On the other hand, there are reasons to believe that the current degradation of tropical forests and the negative impact of commercial logging are not irreversible trends. **Forestry methods which are commercially cost-effective in the short term, as well as economically and environmentally sustainable in the long term, can be put into practice. It has been argued that careful management (including commercial exploitation) is the only way to preserve remaining tropical forests** (Poore, 1988b).

Timber is an important commodity, but in many tropical forests other natural products are extracted (nuts, fibres, meat, medical products, etc), and these constitute a sustainable and important economic resource for local communities. In addition they are sometimes a source of export currencies. A recent ITTO study (HIID, 1988) has shown that in some cases these "secondary forest products" are more valuable than timber, even in the short term. In Sarawak alone, the quantity of wild commercial meat consumed was valued at US\$160 million per year in the mid-1980s (IUCN, 1988).

Potential solutions have been devised which integrate the various forest uses (of local communities, farmers, hunter-gatherers, and timber companies) into multi-use forestry management systems. Large plantations would be restricted to already destroyed areas. Multi-use management is probably the best way of

protecting tropical forests from destructive encroachments, since all users have a stake in their survival and enhancement (HIID, 1988).

The growing international recognition that the survival of tropical forests is necessary for economic as well as environmental reasons, contributed to the formation of the International Tropical Timber Organization (ITTO) in 1986, within the UNCTAD International Commodities Agreements. It is the first international commodity market agreement which lists the protection of the ecological balance of its resource base as one of its objectives. It could provide a bridge between trade, social and environmental concerns, and help create the right conditions for the long-term survival of tropical forests and their development. Other international organizations, rather than concentrating their activities on large-scale environmentally destructive and socially insensitive projects, are increasingly attempting to shift their aid efforts towards projects which link environmental sustainability, socio-economic development and community self-sufficiency.

Why Japan ?

Since the 1960s Japan has been the world's major importer of tropical timber. It therefore has a responsibility to guarantee that this import trade does not have a detrimental impact on the natural environment, or on the social development of exporting regions. This responsibility has become even more crucial now that Japan is a major economic and political power, and plays a key role in the Southeast Asian and Pacific region, where most of the world's tropical timber is traded, and from where most of Japan's own tropical timber imports originate. These facts are being increasingly recognized in Japanese decision-making circles. Two recent examples of this are given below.

One of the most important parliamentary committees in Japan's National Diet, the House of Councillors' Foreign Affairs Committee, recently debated the practical arrangements between the Japanese government and the ITTO, in particular the ITTO's plans to establish its headquarters in Yokohama. During the debate, the main reasons for Japan's involvement in the tropical timber trade and tropical forest degradation were clearly explained. The Minister for Foreign Affairs, Mr Uno, stated:

our country is a place where for a long time people have lived in wooden houses. Consequently, regarding tropical forests (timber), demand from Japan has always been high ... Accordingly, Japan should be the first - before other countries - to recognize it ... (National Diet of Japan, 1988; authors' translation).

A Committee member, Mr Yatabe, was even more direct during the debate:

...the big problem in recent times, and which is responsible for pushing tropical rainforests to the brink of danger, is the destruction of forests through unrestrained logging and development. I feel that these are the focal points... I feel too that your comprehension should include a recognition that Japan bears rather a heavy responsibility for this overexploitation ... (National Diet of Japan, 1988; author's translation).

Japan will always have a natural resources deficit. Attempting to resolve this simply by increasing the volume of commodity imports from other economies, particularly from those which are less able to manage their resource base sustainably, is not a satisfactory solution.

In this context, one can therefore only be encouraged by the way in which the 1988 Japanese White Paper on the Environment discussed these questions. This document is interesting since it covers global environmental problems in a practical, open manner, rather than limiting itself to the description of Japanese participation in inter-governmental programmes, as some previous White Papers tended to do (see for example Environment Agency, 1986). This White Paper (Environment Agency, 1988) notes, referring to the ESCAP report quoted above, that:

...in insular Southeast Asia, the commercial logging was the chief culprit of degradation and an indirect cause of deforestation.

Further on, the White Paper emphasizes that:

The problems of the global environment have passed the stage of making proposals and deliberations and entered the stage of taking concrete actions.

In relation to Japan, the White Paper concludes that:

...it is necessary for Japan to take actions worthy of its position as a great economic power in the world and aimed at the conservation of the environment, and furthermore to make an active contribution to the world. In contributing to the conservation of the global environment Japan should bear in mind that the importance of the Asian-Pacific region has continued to grow.

Chapter One: Japan's Position in the International Tropical Timber Trade

Thirty years ago, tropical timber played a minor role in Japan's timber economy. Import volumes were almost insignificant in comparison with the consumption of domestic timber. The picture in the 1980s could not be more different, either at world level or within Japan. Demand for timber in Japan expanded considerably up until the 1970s. Domestic forests are now only able to satisfy a third of requirements. The rest is imported.

The "North Seas" countries (the US, Canada and the USSR) are the main suppliers of almost all Japanese softwood imports. The "South Seas" countries (the Southeast Asian and Pacific Rim timber producing nations) primarily supply hardwoods.

Tropical hardwood accounts for only approximately 16% of total timber requirements, and around 25% of total timber imports (proportions which have decreased during the last decade). Nevertheless, it is often seen as an indispensable import. This is because of the technical and economic characteristics of tropical hardwoods (they are beautiful, high quality timbers and are remarkably cheap) and because of the allegedly vast expense that would be incurred by the domestic processing industry if it switched from using tropical timber to temperate wood.

1.1 Japan's Share in the World Tropical Timber Trade

The tropical timber trade represents only a fraction of commercial wood products traded at world level: some 12% in value in 1986 (calculated from FAO, 1988). This is not surprising since most of the timber extracted from tropical forests is used locally as fuelwood or domestic structural timber. The developing nations, which now account for nearly 55% of roundwood removed from forests (Figure 2), used 73% of removals as fuelwood in 1986 (FAO, 1988). Between 1976 and 1986, their consumption of fuelwood and industrial timber increased by more than 24%, as against an increase of 17% for the industrialized nations.

Most fuelwood, however, is gathered in open tree formations and already degraded forests in densely populated geographical regions. On the other hand, the majority of commercial tropical timber originates from closed forests. It is these forests that are the most important in terms of conservation.

Only a handful of the tropical countries with closed, accessible, moist forests are significantly involved in the tropical timber trade. As shown in Table A5 in Appendix A, five countries (Malaysia, Indonesia, Papua New Guinea, Côte d'Ivoire and Gabon) accounted for 88.5% of all tropical hardwood timber products (logs, sawnwood, panels and pulp) exported in 1986. One country, Malaysia,

accounted for 49%, including 75% of all exported tropical hardwood logs. As noted in the Introduction, the timber exports in these same countries accounted for a considerable proportion of all wood extracted from forests (see Figure 3). Three of these five countries are Japan's main tropical timber suppliers.

1.1.1 A Giant Among Tropical Hardwood Importers

Japan is the world's largest importer of tropical hardwood products. In roundwood equivalent (RWE), Japanese imports account for nearly half of all tropical timber imports of the industrialized nations, and for more than a quarter of the international trade in tropical timber (Figure 2). Indeed, the necessity of importing primary products to meet the requirements of domestic processing industries has been at the core of Japan's trade and industrial policy for a long time (see Figure 5). In 1986, primary products (petroleum, raw materials and foodstuffs) accounted for nearly 58% of the value of all imports. The equivalent figure for the European Community (EC) is 30% (Eurostat, 1988).

Box Four: Europe and Japan — a Comparison

The differences between EC and Japanese tropical hardwood imports, and wood consumption in general, are substantial. The far lower consumption of forestry products per person in the EC (for instance, the annual consumption of paper and paperboard in the EC is around 81kg per person, as against 167kg per person in Japan (Eurostat, 1988; JPA 1987)) is one of these. Differences in the structure of tropical timber imports are also considerable.

Figure 6 shows the relative importance of the two main tropical timber importers, namely Japan (population 122 million) and the EC (population 322 million).

While the levels of tropical timber imports in terms of roundwood equivalent volumes (RWE) are of the same order of magnitude in Japan and in the EC, the similarity ends there. In 1986, 75% of Japanese imports consisted of hardwood logs. (The comparative EC figure was 25.8%.) In Japan, imports of sawnwood accounted for just over 10% of the total imports in 1986, and plywood for another 1.1% (all figures RWE). In 1987 the plywood share grew, owing to a substantial increase in imports from Indonesia, but still remained relatively small. In the EC in 1986, sawnwood imports accounted for nearly half of the total RWE tropical timber imports, and plywood and veneers for a further quarter.

Figure 5: Timber Product Supply and Demand Balance in Japan 1986
(All figures in millions of cubic metres of roundwood equivalent)

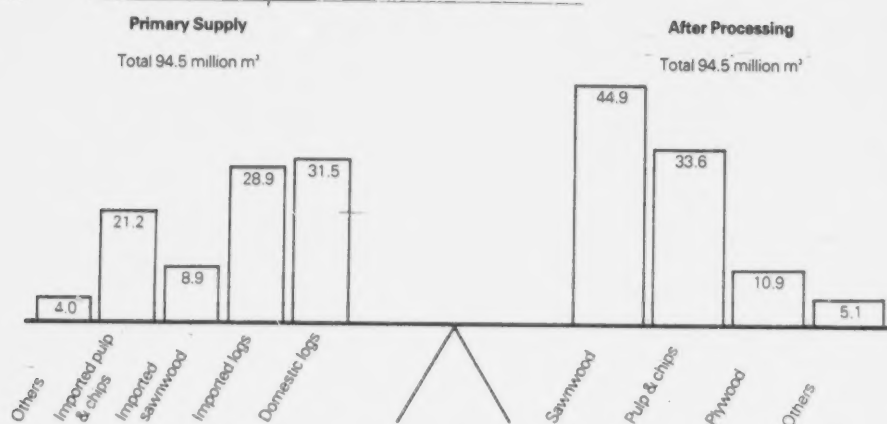
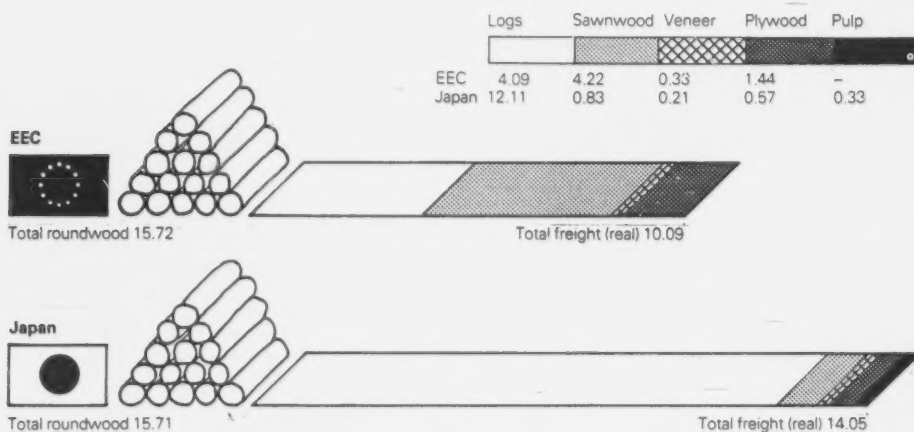


Figure 6: Tropical Hardwood Imports in 1986 by the Two Importing Giants; Japan and the EEC
(Freight volumes and roundwood equivalent volumes in million m³)



Note: (a) Only tropical hardwood imported from tropical countries is accounted for, the EEC also imports 0.1 million m³ of tropical veneer from USA and South Africa.
 (b) The EEC and Japan both import small volumes of coniferous timber products from tropical countries and from non-tropical developing countries (such as Chile) which are not shown here.

Much of the difference can be attributed to the relative strengths of the wood processing industries specializing in tropical timber. In the EC, only a few countries have maintained the processing facilities which would allow them to peel, slice or saw tropical hardwood. The Mediterranean countries of France, Italy and Greece still have a significant plywood production capacity while Spain and Portugal mainly use tropical logs in their domestic sawmills (Nectoux and Dudley, 1987). But generally, northern European countries import plywood and sawnwood directly. The UK and the US are the largest consumers of imported tropical plywood. Many European countries import tropical hardwood products rather than logs, as processing is a competitive but not high-value-added operation.

In direct contrast, the structure of Japan's imports of tropical wood products is largely tied up with the requirements of its domestic plywood industry, which is very strong, producing around 7.4 million m³ a year, mostly from tropical hardwoods. A leading expert at the Japan Overseas Forestry Consultants Association summarized the situation as follows:

These wood processing industries were well equipped, their technical standards relatively high and their recovery rate of products exceptionally high compared to that of other countries.

Business enterprises could obtain greater profits from the domestic processing of raw logs and meet the diversified market needs, rather than import processed products from overseas countries (JOECA, 1986).

The value of EC imports of tropical timber products is higher than the value of Japanese imports of tropical timber. This is because European countries import higher value processed products such as plywood and doors from Southeast Asia, and the Far East, especially (see Figure 7). Japanese imports consist mostly of logs and therefore of a lower value.

The geographical origin of imports is another area of difference between the tropical timber trade of Japan and that of the EC. Figure A3 in Appendix A shows the main tropical hardwood timber trade flows between tropical countries and other regions of the world for 1986. Japan is supplied almost exclusively by Southeast Asian and Pacific nations. The EC has a much more diverse pattern of supply: tropical logs are supplied mainly by West African countries such as Cameroon, Gabon and Côte d'Ivoire. Tropical sawnwood is supplied to the EC by Southeast Asia and West and central Africa in almost equal measure. Côte d'Ivoire and Malaysia each account for a quarter, Indonesia is the main

supplier of plywood to EC countries such as the UK and the Netherlands which are both large importers. (Japan mainly uses hardwood for plywood manufacturing, whereas the EC tends to use coniferous and mixed woods – ie coniferous core with hardwood faces – for this end-use.)

Japanese imports of forestry products (temperate and tropical) form the fourth largest single item in external trade – after fuel, food and fishery products, but before minerals. In 1987, imports of forest products were valued at US\$10.4 billion, including logs, sawnwood, panels, pulp and paper, but excluding furniture. Within this total, tropical hardwood logs were valued at more than US\$1.9 billion (Japan Tariff Association, 1988b).

Japan is now highly dependent on imported supplies for the satisfaction of domestic demand (see Figure 4). This has not always been the case. The dependency on imports for timber products grew from 5.5% in 1955, to 55% in 1970, reaching a peak of 69.2% in 1979 (Handa, 1988). In 1986, it amounted to 66.5% (Forestry Agency, 1988). Higher dependency ratios can be found only in countries such as the United Kingdom and in regions such as the Middle East, which are largely devoid of extensive forest areas.

Most of these imports are softwoods (coniferous) timber. In 1987 coniferous timber made up 55% of all log imports and 84% of all sawnwood imports. The proportion of softwoods has increased through the years. For instance, imported softwood logs only represented 45% of log imports in 1973 (Handa, 1988). Softwood is mostly supplied by three countries: the US, Canada and the USSR. Together, these three account for 54.9% of all Japanese log imports. The US and Canada together account for more than 70% of all sawnwood imports. The remaining softwood imports come mostly from New Zealand and Chile.

Hardwood imports from developing nations are nevertheless considerable. They account for 45% of total log supplies from abroad. As an industrialized nation, Japan not only imports the largest volumes of timber from Third World nations, but also has the highest dependency ratio in relation to them. Most of these supplies are tropical hardwoods – which is not surprising since around 97% of closed tropical forests (FAO, 1982) are broadleaved tree formations, and very few non-tropical developing countries export timber to Japan (the main one being Chile, which exports coniferous timber).

Figure 7: Comparison of EEC and Japanese Imports of Tropical Timber Products in 1986
(All figures in US\$ million by CIF value)

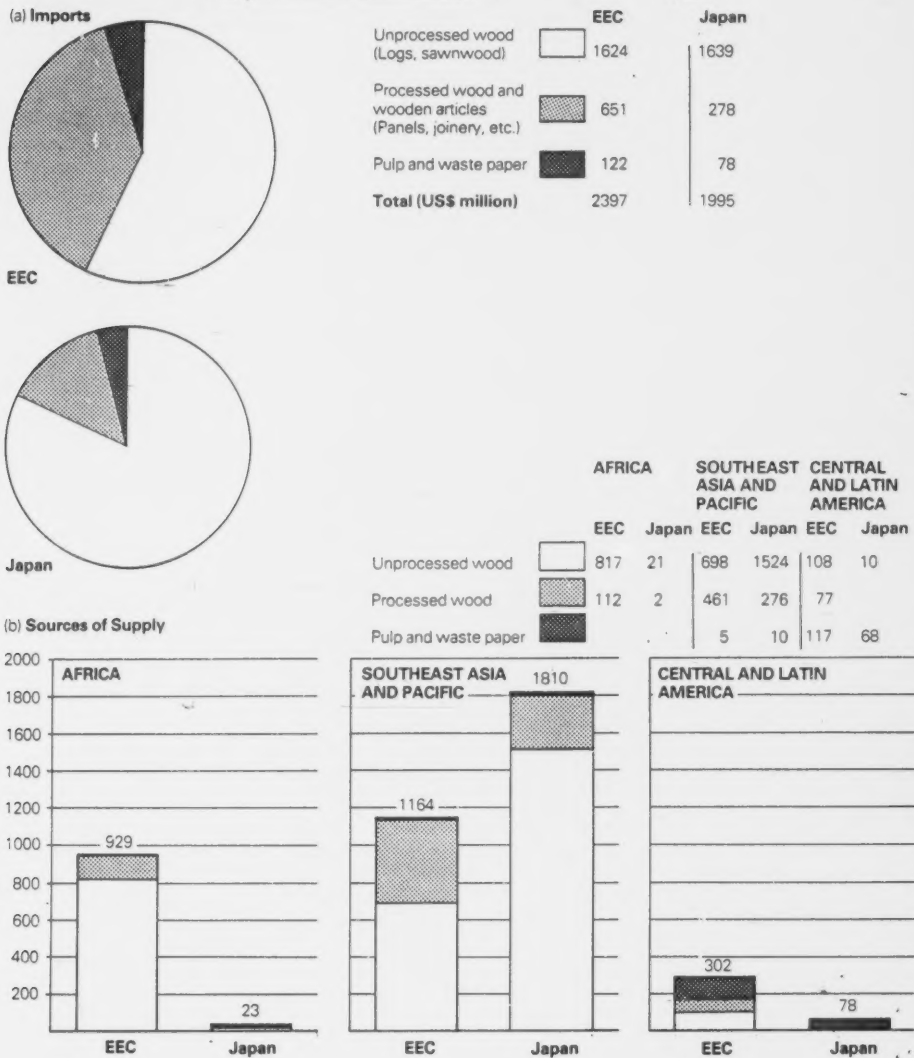
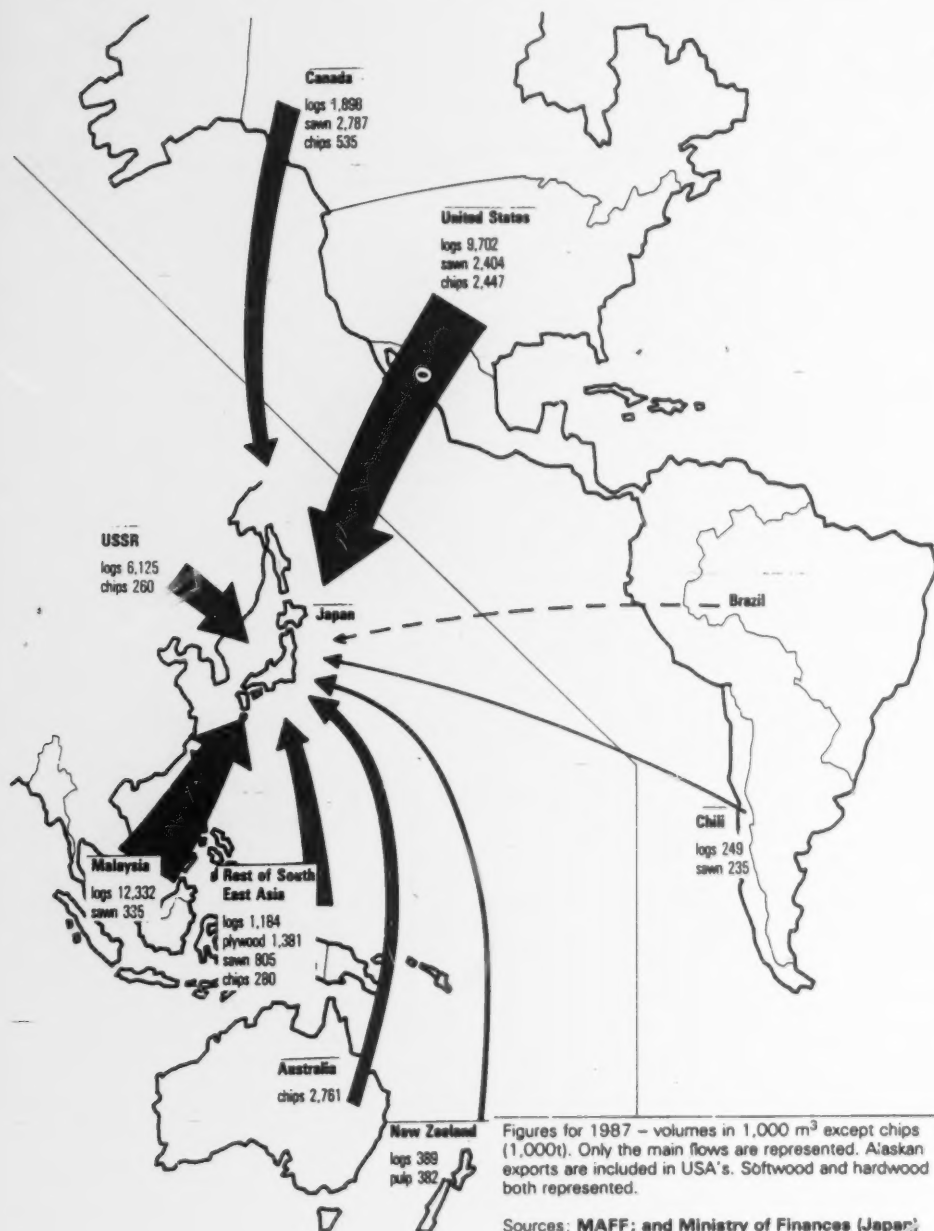


Figure 4 The Pacific Rim: main timber supply source for Japan



1.1.2 The Regional Basis of Japan's Tropical Timber Trade

The region formed by the Southeast Asian producing countries and Japan dominates the world tropical timber market. In 1986 the four largest producing countries in the region (Indonesia, the Philippines, Malaysia, and Papua New Guinea) accounted for 86% of the world's tropical hardwood timber trade in roundwood equivalent. Japan imported nearly 29% of all tropical hardwood timber products traded on the international market (including primary trade of logs, sawnwood, panels and pulp but excluding the re-exports of "transit processing" countries such as Hong Kong and Singapore).

Japanese tropical hardwood log supplies originate mainly from the two Malaysian states of Sabah and Sarawak (see Figure 8). In 1987, Sabah supplied 7 million m³ (50%) and Sarawak 5.5 million m³ (39%). Papua New Guinea, the next largest supplier, contributed less than 7%. Indonesia and the Philippines which were previously dominant, have banned the export of logs, as has Thailand.

Latin America and Africa provide little timber, with the exception of Gabon, which sells okoume and sipo logs (which are particularly suitable for plywood milling) to Japan.

In late 1988, two shipments of 38,500m³ of plywood logs were received from Brazil, a possible precursor of a major log supply operation. Log exports from Brazil have, theoretically, been banned since 1973. But special dispensation seems to exist for logs extracted from areas due to be flooded by dams. (In Amazonia, these areas are becoming more and more extensive; 600,000ha are expected to be logged over during the next few years.) Japanese trading houses and other companies which import logs (Nichimen, C. Itoh, Dantani, Matsue Plywood), therefore anticipate a great deal from this trade. As one trader declared to Japan's daily timber trade newspaper:

...the depletion of tropical timber resources in Southeast Asia has become a matter of reality today, so we have to look to Brazil for a new supply of resources because our trading house has an obligation to supply raw logs to plywood manufacturers. Also, this new situation would create a new bargaining power against Sabah and Sarawak and Indonesian plywood (Nikkan Mokuzai Shimbun, 1988a).

Imported tropical sawn hardwood comes predominantly from three main Southeast Asian suppliers, but here the "older" producing countries which have developed a sawmilling capacity since the 1960s, are more important. Indonesia accounts for 44.5%, the Philippines for 14.5% and Malaysia for 26% (mostly from Peninsular Malaysia). Few supplies come from

Latin America, and there are none from Africa.

Importing veneers for plywood manufacturing is not new for Japan, but imports have been increasing since the early 1980s, 50% of them come from Malaysia. Importing plywood from tropical countries however, is a new development. Most plywood imports come from Indonesia; 1.37 million m³ in 1987, which accounts for nearly 95% of all plywood imports into Japan. (Japan also imports small quantities of coniferous plywood from the US and Canada).

Clearly, Japan relies on a narrow resource base. Sabah and Sarawak forests together accounted for 89% of Japan's tropical log imports in 1987, which in turn accounted for 59% of its imports of tropical timber products (logs, sawnwood and panels in RWE). **Another way of looking at the geographical concentration of Japan's sources of supply is to note that three-quarters of tropical timber products (in RWE) come from the island of Borneo. Logs come from Sabah and Sarawak in the North, and a considerable proportion of Indonesian plywood, veneers and sawnwood exports to Japan come from Kalimantan, the southern part of Borneo.** It is by no means certain that this situation can continue for much longer. Other countries are now competing for the same resources, and the quality of available logs is falling, especially in Sabah.

1.2 The Japanese Tropical Timber Trade: a Young Industry

Japan's dependence on imports for two-thirds of its domestic timber requirements, and the almost total dependence of its plywood industry on tropical hardwood logs, have only developed over the last three decades. Such dependence is partly the result of the "logging boom" which erupted in the 1960s, first in the Philippines and later in the other South Seas countries. This itself was largely a consequence of the Japanese government's economic and political decision to drain logs from these developing nations, which it treated as a single resource base for its wood processing industry.

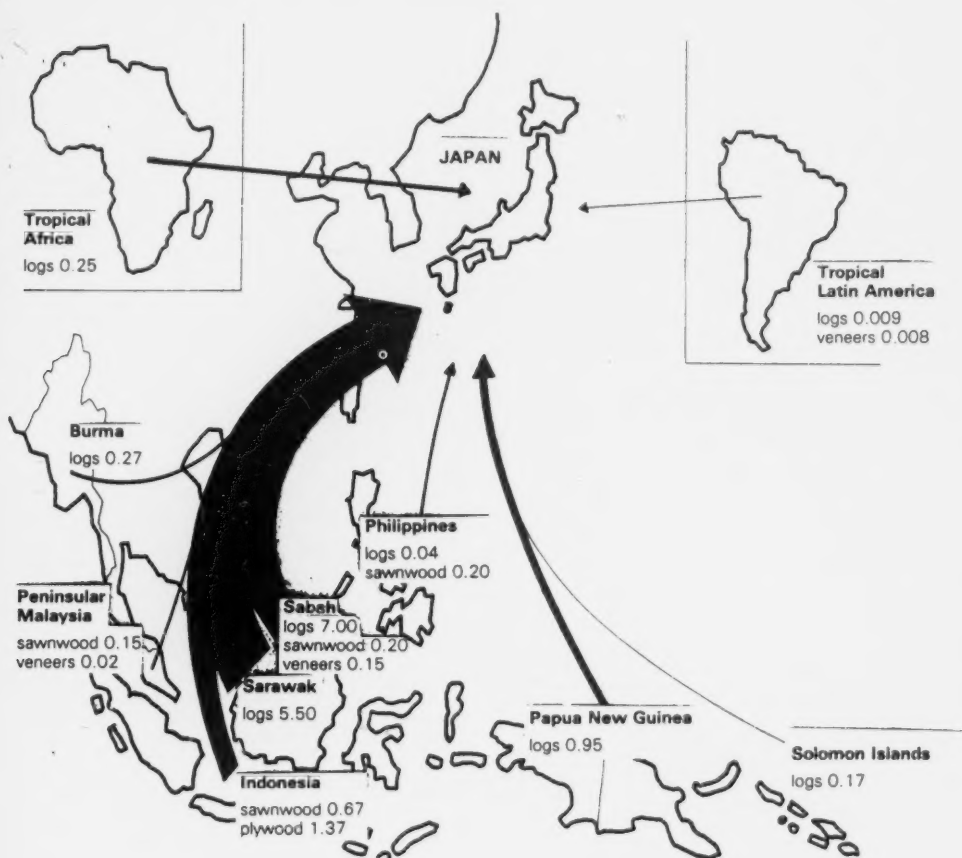
For the Japanese timber industry, the last 30 years have simply been another period of change. On numerous occasions Japan has had to cope with environmental and economic crises due to the overexploitation of hill forests. The response has been to develop a tradition of public and private forestry based on replanting and logging controls.

Figure 8 Main Suppliers of Tropical Timber to Japan in 1987

Japan Total tropical timber imports in 1987
millions m³

	Volume	RWE volume
Hardwood logs	14.00	14.00
Coniferous logs	0.15	0.15
Hardwood sawnwood	1.28	2.33
Coniferous sawnwood	0.14	0.23
Hardwood veneers	0.29	0.55
Hardwood plywood	1.46	3.36
Total		20.62

Pulpwood not included
All volumes in millions m³
RWE volumes: coefficients FAO



Sources: Japan Tariffs Association 1988; JPMA 1988

In Japan, forests have been the source of fuelwood and charcoal, as well as of timber. (Timber was the main building material for centuries.) Farmers lived symbiotically with the forest in many areas of Japan, and some developed very sophisticated agroforestry systems. In the words of one commentator:

...this forestry system may be said to be one of Japan's greatest achievements (Izumi, 1988).

When forests were depleted – for instance at the end of the fifteenth century – disaster often followed. This included regional near-famine and required drastic responses on the part of the authorities. Even the Akita prefecture region, always one of the most important forestry areas on Honshu, experienced such crises (Tottman, 1985).

1.2.1 The Upsurge in Tropical Hardwood Imports

Total Japanese imports of timber products increased tenfold between 1960 and 1973, and those of tropical logs sixfold. Since then, imports of tropical logs have fallen back by nearly half. The reasons for this fluctuation are discussed below.

Postwar Timber Requirements and Supply Problems

The war years were accompanied by heavy logging on the islands of Japan, since the country was unable to rely on its colonies for timber during this time. (Prior to the war, Korea, Sakhalin and Manchuria had accounted for 45% of the commercial forest area available to Japan.) War demands, and poor management were responsible for the serious depletion of domestic forest reserves.

After the war ended, Japanese forests continued to be overlogged. The country's needs were considerable and it did not have the means to engage in importing on a large scale. Strict industrial and trade priorities were established. The need to secure new sources of supply for primary products (oil, lumber, steel, textiles, etc) persisted throughout the postwar reconstruction period and up until the beginning of the 1960s (Takeo, 1984). The first major investment to be made abroad was a joint venture with US interests in November 1953, for exploiting Alaskan timber for pulp.

The 1950s were favourable to the owners of Japan's forests. **Domestic demand, already pushed up by reconstruction requirements, started to grow very quickly during the Korean war since Japan was used as a procurement and supply base by US military authorities.** During this period (known as "tokuju keiki") timber imports (as were all imports) were subject to quotas.

As shown in Figure 9a, domestic timber demand increased from 44 million m³ in 1955 to 66 million m³ in 1961. This does not account for the 15 million m³ of other wood products (mostly charcoal, which was a major fuel in Japan at the time). The need to increase and modernize the very badly decaying housing stock was particularly pressing. The price of domestic timber therefore rose rapidly (by 60% during the 1950s). At the same time, replanting was deemed a national cause, with the Emperor launching afforestation campaigns.

Despite increased logging, domestic timber could not meet Japan's requirements at a reasonable cost, and several measures were introduced to increase supply in the late 1950s. These included: a liberalization of timber imports from North America and the USSR; attempts to find substitutes for timber; improvements in timber processing efficiency; and most important of all, an increase in National Forest logging from 1958 onwards (through the Productive Capacity Reinforcement Plan of National Forests).

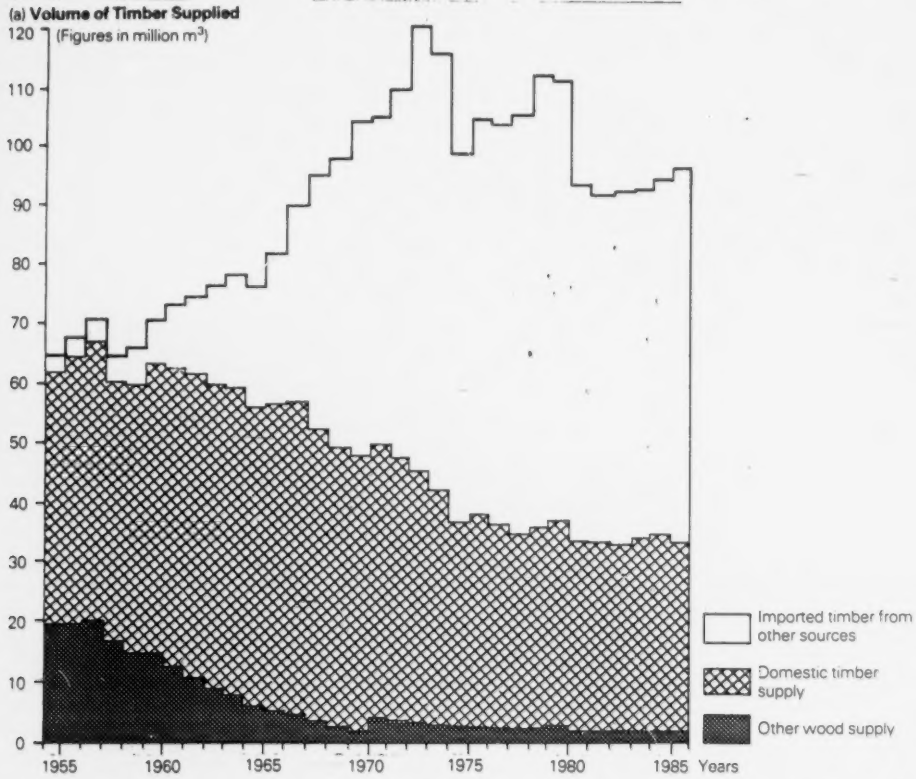
But these measures were not enough to stabilize the market and the situation came to a head in the early 1960s. In one year, from 1960 to 1961, national expenditure grew by 14.5% in real terms, and the number of new dwellings increased by 26%. In August 1961, confronted by an ever-increasing demand for timber that could not be satisfied by domestic production, the government introduced the "Emergency Measures for Timber Price Stabilization". These measures were mainly concerned with increasing the production of domestic forests, particularly that of National Forests. Intensive logging therefore occurred in many areas during the 1960s.

The emergency measures also promoted mass timber imports, following the recently adopted policy of free trade (see Figure 9b). This helped start the "logging boom" in the South Seas countries and foreshadowed Japan's transformation into the world's largest tropical timber importer.

The Beginning of Mass Tropical Timber Imports

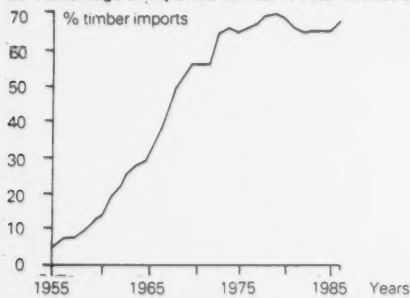
Tropical timber had been imported prior to the 1960s, but at a lower level. Annual imports of iuan (or "mahogany") from the Philippines had reached half a million m³ by 1952, and 4 million m³ by the end of the 1950s. However, they were imported into Japan for processing into plywood and the best quality production was then re-exported to the US. This trade, which enjoyed special government privileges since it helped to obtain precious currency for the Japanese economy, enabled modernization and development of the plywood

Figure 9: A Fast Transition: the Move from Domestic Timber Supply to Imports



Note: Other wood supply includes fuelwood, charcoal and Shiitake mushroom log-beds (the last category is included in domestic timber up to 1970).

(b) Percentage of Imported Timber in Total Timber Supplied



manufacturing industry to take place.

The 1961 "Emergency Measures" resulted in a rapid increase in hardwood imports from Southeast Asia. Between 1960 and 1963, total log imports more than doubled; those from Southeast Asia increased by 70%. By 1973, the peak year, tropical log imports had increased nearly sixfold, from 4.5 million m^3 (in 1960), to 27 million m^3 . **Most of this supply was and still is used for plywood processing. It fills 3,000 to 3,500 fully loaded ships per year. In 1973 18 million m^3 of lauan were processed into 2,077 million m^2 of plywood, which was only just sufficient to meet domestic demand.**

Japan had stopped exporting plywood in the late 1960s. In the early 1970s it was importing some plywood from Taiwan and South Korea. The rest of the tropical hardwood, and some tropical softwood log imports, were used by the sawmills – about 9.5 million m^3 in 1973. It was not until 1975 that Japan began to import tropical sawnwood in any quantity.

The Aftermath of the Mid-1970s Crisis

The "dollar shock" of 1971 and the "oil crisis" of 1973 changed people's view that the "sky is the limit" as far as economic growth is concerned, and led to the so-called "stable growth" economic era. This brought in a "second period" of tropical timber imports. During 1973-74, national expenditure fell by 1% in real terms and the wholesale price index jumped by 31%. The construction industry was immediately affected and the number of housing starts decreased by 31% in 1974. This had a significant impact on the consumption of wood products.

Total timber supplied fell by 4% in 1974, and by a further 15% in 1975. Timber imports were more affected by this fall than domestic supplies, which had been falling anyway since the early 1960s owing to the lower price of imported timber (see Section 1.2.3). Tropical log imports were most severely affected, falling by 35%.

1973 to 1975 was also a period when exporting countries changed their approach to timber exports. In 1974, SEALPA (Southeast Asia Lumber Producers' Association) was formed in order to strengthen the position of tropical timber exporters. It aims to do this by introducing reforms and encouraging investments, so that the dependence of its members on log exports is reduced.

Consumption and imports partly recovered in the late 1970s, but the world economic slump of 1980-81 reduced the demand for timber once again. Construction activity in Japan, which had partly recovered in the late 1970s, became sluggish. Global timber demand, which had reached around 110 million m^3 roundwood

equivalent in the late 1970s, fell and stabilized at just over 90 million m^3 . Once again, imports were most affected. They fell by nearly a fifth between 1980 and 1981, stabilizing at just under 60 million m^3 (RWE). Nearly all categories of imported timber supplies were reduced, but logs fell the most. Log imports from all supplying countries fell by 35.5% between 1979 and 1985. Tropical log imports fell by 29%.

In 1987 and 1988, imports from tropical countries recovered. However, their growth is not as impressive as that of temperate softwood imports. It appears that the old patterns have been significantly modified.

1.2.2 Changes in Patterns of Supply in Southeast Asia

The Philippines, a main supplier of tropical timber during the 1960s, was replaced by other countries, which in turn have themselves disappeared as suppliers of raw materials (for example, Indonesia). In the case of logs, this pattern is illustrated in Figure 10.

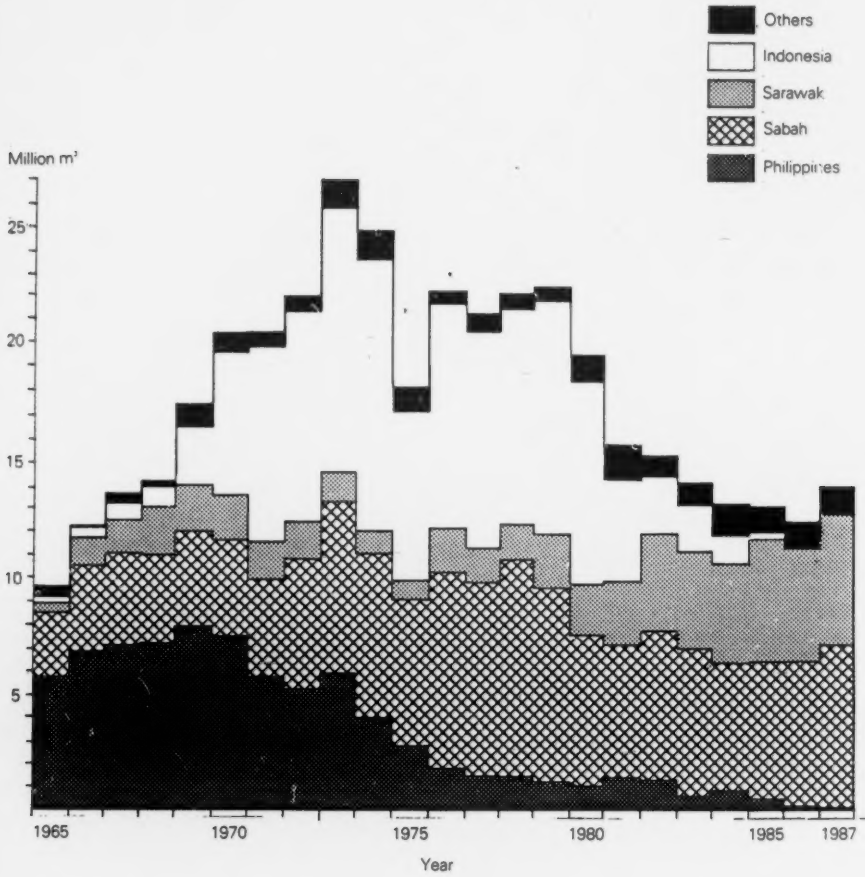
The Case of the Philippines

The decline of the Philippines as a tropical timber exporter was due to the over-exploitation of available timber resources, the impact of agricultural land development and the failure to implement a ban on log exports. Japan first imported Philippine "mahogany" in 1951. These imports were intended to complement domestic hardwoods for plywood manufacture.

Logging to meet Japan's needs increased steadily throughout the 1950s, but it was not until the so-called logging boom of the 1960s that it increased dramatically. In 1969, the peak year, 8.3 million m^3 of logs were exported to Japan. Then in the early 1970s, exports started to decline. The high density dipterocarp stands in easily accessible areas were becoming exhausted and the remaining sources were not only more expensive but also of a lower quality.

Logging continued in the Philippines, but centred on Luzon rather than on Mindanao, which had been largely deforested. In principle, a ban on exports, as well as a ban on logging in seven provinces, later reduced to six, were introduced in 1976. However, neither of these bans was applied effectively (see Chapter 3). The government repeatedly delayed implementation of the log export ban for "economic recovery policy" reasons and so it was not fully applied until 1986. At that time, the new Minister for Natural Resources, Mr Ernesto Maceda, stated that Philippine forests had been subjected to "severe exploitation and wanton plunder" (Asian Timber, 1986).

Figure 10: Changes in the Geographical Pattern of Tropical Hardwood Supply 1965–1987



Note: Peninsular Malaysia is included in 'Others', which also include Papua New Guinea, Solomon Islands, Gabon, Burma, etc.

The Rise and Fall of Indonesian Log Exports

The Philippines' decline as Japan's main log supplier was paralleled by the growth of Indonesia as a major exporter (after the opening of Kalimantan to logging). Indonesia replaced the Philippines as Japan's largest log supplier in 1971. But by the 1970s it was obvious that, due to export restrictions, Japanese plywood manufacturers could not continue to rely on Indonesian logs for their operations.

In 1974 Indonesia exported nearly 11.5 million m³ of logs to Japan (47% of Japanese tropical log imports, which were then at their peak level), 8 million m³ of which came from Kalimantan. A large number of Japanese trading companies entered into joint ventures with Indonesian concerns just as they had done a decade earlier in the Philippines (see Chapters 3 and 4). But the logging projects in Indonesia were on a grander scale. They had been prepared as a result of concerted policy developments between the Japanese administration and Japanese corporations (see Section 4.1.1).

In 1978 and 1979 log imports from Malaysia were greater than those from Indonesia. Imports from Indonesia were halved between 1980 and 1981, and again in 1982. By 1986, Indonesia had ceased to export hardwood logs. (Indonesian government policy aimed at developing the country's plywood processing export capacity. The government therefore began to implement restrictive measures on log exports as early as 1978.)

The Emergence of Sabah and Sarawak

Malaysia had taken over from Indonesia as Japan's main supplier of tropical logs as early as 1978. During that year, Malaysia exported 10.7 million m³ to Japan, 49% of Japanese tropical log imports. By the time the Indonesian ban became effective, this proportion was equivalent to 89%, largely because Japan's requirements had fallen considerably.

Malaysia can be divided into three main producing regions. In Peninsular Malaysia – which groups several states – log exports are under a near total ban. Timber exports consist mostly of sawnwood. All log supplies come from the two Borneo states (Sabah and Sarawak) which have their own forestry departments and forestry codes. Imports from Sabah peaked in 1978 (9.2 million m³), and fell to around 7 million m³ in 1987, but they still represent half of Japan's tropical hardwood log imports. Sarawak's exports to Japan have been growing steadily and have now reached 5.5 million m³ per year.

The authorities in Sabah and Sarawak have repeatedly pledged that they will continue to supply Japan with a steady flow of logs.

Japanese traders are nevertheless constantly on the look out for new sources of supply. Other countries currently supplying Japan with logs include Papua New Guinea (0.87 million m³ officially exported in 1987 (Timber Digest, 1988), although Japan claims to have imported 0.95 million m³); the Solomon Islands (log exports to Japan in 1987 fell to 0.17 million m³, after having reached 0.27 million in 1986); and most of the other Southeast Asian and Pacific countries, which supply smaller volumes of logs (for example Brunei, Burma, China and Vietnam).

Future Trends

Japan has traditionally used imports from Southeast Asian countries to meet its tropical timber requirements. It will be interesting to see whether Africa and South America begin supplying Japan with raw logs or processed timber in any significant volume, particularly since Brazil is now exporting logs. The basic requirements of the Japanese traders and the processing industry are security of supply and consistent quality. The specific characteristics of Southeast Asian forests means that these are easily satisfied. However, the fact that other regions are not so fortunate in this respect, is perhaps not the barrier to the development of trade links that it once was. Technological developments have helped in this respect.

1.2.3 Productivity, Costs and Price Formation

Japan's dependence on imported timber products is initially surprising considering the country's considerable forest resources. A high proportion of the 25 million ha of Japanese forests is under environmental protection. (There are 8 million ha of protected forests and 4 million ha of national parks.) But this has little impact on commercial forestry since logging and management restrictions are quite limited. The main problems are that Japanese forests are not highly productive, their maintenance costs are high, and they are unable to compete with cheap imports from overseas.

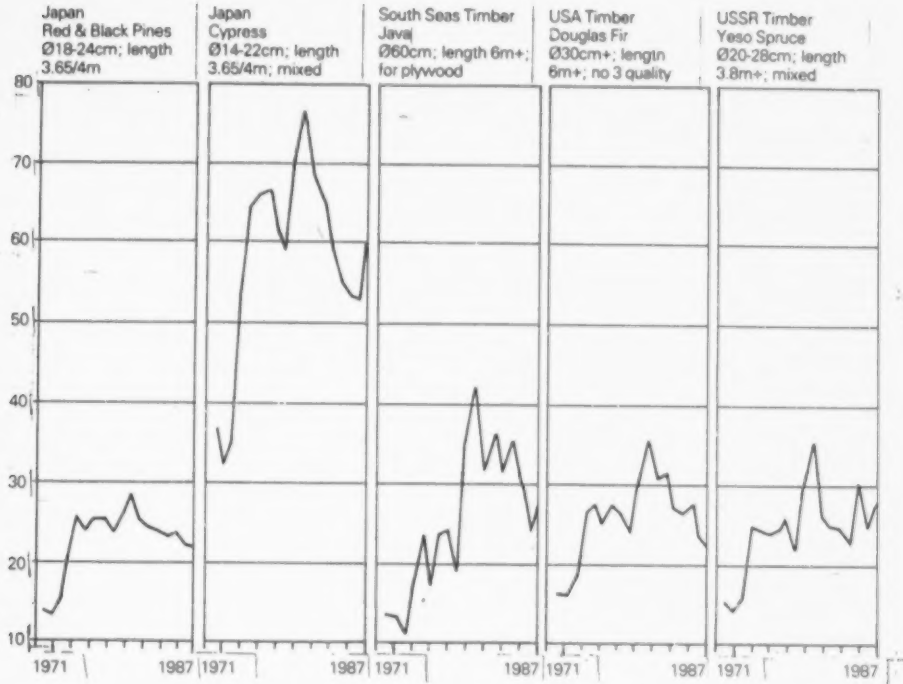
The Costs of Domestic Timber

Figure 11b shows some of the costs involved in producing timber in Japan, and Figure 11a compares the current prices of various domestic and imported logs. These figures illustrate the current predicament of Japanese domestic commercial forestry.

In contrast to import prices, domestic log prices continued to grow during the late 1950s (when prices of imported logs were actually falling), the 1960s (when they more than doubled in real terms) and most of the 1970s. However, during the 1980s their price fell in current terms (and therefore even more in real terms) before recovering in 1987 (reflecting the price of

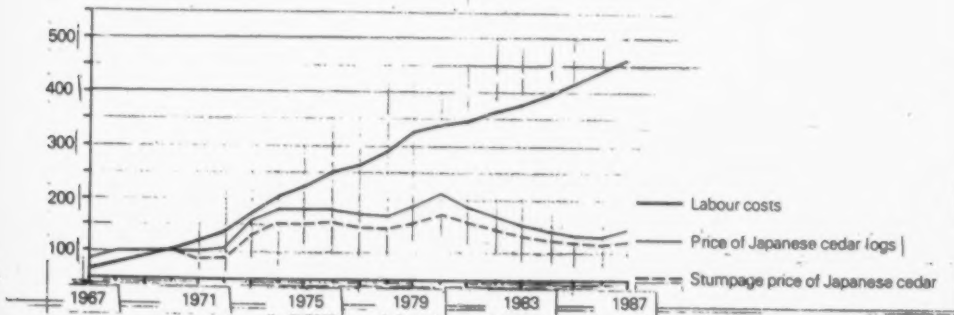
Figure 11: Wholesale Prices of Imported and Domestic Logs, and Japanese Domestic Forestry Labour Costs

(a) Evolution of Wholesale Prices of Imported and Domestic Logs

1,000 Yen/m³

(b) Japanese Forestry Labour Costs Versus Logs and Stumpage Prices of Japanese Cedar

(Base 100 in 1970)



imported timber). This price pattern evolution had dire consequences for commercial forestry in Japan, because at the same time, productivity costs increased considerably. To make matters worse, the industry's productivity was very low by international standards.

Since the early 1960s, costs such as those for labour, have increased rapidly, multiplying 11 times in current terms between 1963 and 1986 (Nevertheless, despite significant increases, the wages paid to forestry workers are still not attractive enough, when compared to those of industry, to retain people in the mountainous areas.) Stumpage prices on the other hand were not much higher in 1986 than they were in 1963. The stumpage and log prices shown in Figure 11b are those for sugi (a Japanese cedar-like redwood), but one could have taken the example of hinoki (a Japanese cypress) and come up with a similar result. Sugi (*Cryptomeria japonica*) and hinoki (*Chaemaecyparis obtusa*) are Japan's most important commercial species in terms of volume and value.

High costs are making some of the by-products of forest management, such as thinnings, totally unattractive to the timber market. The costs of thinning activities (especially in terms of labour) and of removing small diameter logs are so high in some instances, that only those thinnings placed close to main forest roads are carried away and used for sawnwood, poles, etc. The lack of thinning was recognized as one of the Japanese forestry sector's major problems in the 1970s.

The current market position of Japanese timber is also problematic because the age structure of stands is skewed towards some age classes. A comparison between the commercial forests of Japan and the Federal Republic of Germany shows that in 1980, coniferous trees of less than 20 years, and between 20 and 40 years old, represented 44% and 45% respectively, of the total stock in Japan, compared with around 28% and 21% in Germany (ECE/FAO, 1986). This is because most of the plantations were created during the 1950s and the 1960s. (These should reach maturity in the 1990s, by which stage they will represent a sizeable asset – provided market prices are high enough (see chapter 5).)

The low commercial productivity of Japan's timber growth is a further problem. Japan has approximately the same volumetric resources of wood per hectare of forest as either Europe or the US. (Both have 120m³/ha compared with Japan's 117m³/ha.) On average it also has the same wood growth per year (3.83m³/ha, as against 3.80m³/ha in Europe and 3.64m³/ha in the US). But the extracted volume in Japan is only 1.67m³/ha, as against 2.58m³/ha in Europe and 2.07m³ in the US.

Box Five: Imported Timbers – the Price Makers

Internationally traded timbers are commodities. As such their price formation depends on three major factors: the marginal costs of production and transport; the level of general economic activity in the main demand markets; and the trends followed by prices of "sister" commodities or competing products. These prices are also particularly sensitive to short-term market movements and speculative operations.

Many factors influence medium-term price formation (ie over a year or two). In relation to Southeast Asian timber, one can highlight the importance of:

- the producer price, which can vary widely, for speculative or other reasons such as the type of wood currently available from logging areas and sawmills, the particular season of the year and so on; the exchange rate between the US dollar and the yen (and up to a point, between local currencies and the yen) is also a factor;
- royalties, duties and taxes in the exporting country, transport costs (depending on oil prices and scarcity of over-capacity of bulk carriers in the region), and import duties are also elements of the import price;
- the prices of the dominant, most competitive product on the Japanese market, which is in fact North American timber; the size of US supply and demand markets are such that prices of Japanese domestic timber are indirectly influenced by the level of construction activities in the US itself;
- producers' expectations concerning the future economic situation, the strategies adopted by competing suppliers or by competing importers, the policies to be adopted in the near future by governments in relation to the timber industry and export duties.

For the most part, Japanese importers seek to moderate short-term price variations. Consequently there is often a time lag between a change in price at producer level and in Japan at wholesale level. For plywood, wholesale short-term price movements are generally far smaller since Indonesian prices are not the major factor in price formation. The plywood price in fact depends on the activity levels of the construction industry. Plywood manufacturers can find themselves squeezed out of activity if there is a concurrent increase in tropical log supply prices (the trading companies can only dampen price jumps for a short while) and a slump in construction. A combination of high costs and low wholesale prices occurred in 1980, 1982 and 1986. The situation is relatively similar for sawnwood.

1.3 The Search for Uniform Supplies

Japan has traditionally concentrated on hardwood log imports – a cheap high quality raw material processed in Japan with technologically advanced equipment. However, we must ask if this model is still viable and if so, for how long it will continue to be so.

1.3.1 Mostly Logs?

Logs still dominate Japanese tropical timber imports, constituting 79.3% of the total in roundwood equivalent in 1986. However, there are indications that Japan is slowly moving away from being a "log-only" importing nation. Tropical sawnwood imports and plywood manufactured in tropical countries are becoming a permanent feature of the Japanese timber industry.

As shown in Figure 12, imports of hardwood logs from tropical countries have been declining since the late 1970s. On the other hand, tropical sawnwood imports, which were insignificant before 1973, grew to nearly 1.4 million m³ in 1987 (including softwoods and hardwoods, but excluding imports from non-tropical developing countries such as Chile and South Korea).

As far as plywood is concerned, the late 1960s represented a turning point, with Japan temporarily becoming an importer rather than an exporter. Japan had lost its share of the US market to Korea, Hong Kong and Taiwan, and domestic demand had risen so fast that imports, mostly from Korea, had to be brought in. From the mid-1970s to the mid-1980s, little plywood was imported or exported. Plywood imports increased dramatically again in 1986 and 1987, representing 7.5% of total supply in 1986 and 15.7% in 1987.

This increase is due to the competitiveness of Indonesian plywood, compounded with the reduction of import duties on plywood. Until 1988 many plywood manufacturers seemed to cling to the belief that the surge of imports would be short-lived, merely a response to excess demand and a lack of production capacity resulting from mill closures earlier in the decade. This hope was largely illusory. Figures for the first 11 months of 1988 showed that plywood imports actually grew in comparison to the same period in 1987. They now represent 19.5% of total deliveries (Nikkan Mokuzai Shimbun, 1988b). The total volume of imports reached 1.81 million m³ by the end of 1988 and plywood imports were up 32.3% on 1987 (Harago, pers com.).

In general, the composition of imports in value terms is leaning towards processed timber products. The total value of wood and wood product imports (including chips, paper, joinery, etc) amounted to Yen 1,601 billion (US\$11.03 billion) in 1987. Of this total, US\$4.35 billion, or 39%, were log imports. The remainder was either chips and pulp (US\$1.44 billion) or processed or manufactured goods.

If one considers only tropical timber, the trend is similar. In 1986 the total value of wood products imported from tropical areas was US\$2.27 billion, including furniture and joinery, as well as paper and paper products (OECD, 1988). Tropical logs (hardwood and softwood) only accounted for US\$1.39 billion (61%) in 1986, the rest being sawnwood, joinery and chips. In 1984, the value of tropical logs imported by Japan was US\$1.72 billion (OECD, 1986), or 69%.

Therefore, the current increases in imports of processed and semi-processed products made of tropical hardwoods appear to signal a strong trend. It is not a short-term compensatory movement such as the one which occurred in relation to plywood in 1973 and 1974, when insufficient domestic processing capacity, during a brief period of re-adjustment, necessitated a swift increase in plywood imports from Korea. The high relative value of the yen improves the competitiveness of foreign processing and manufacturing industries on the Japanese domestic market. These industries have lower processing costs than their counterparts in Japan, and the fall in customs duties has made processed timber imports even more competitive.

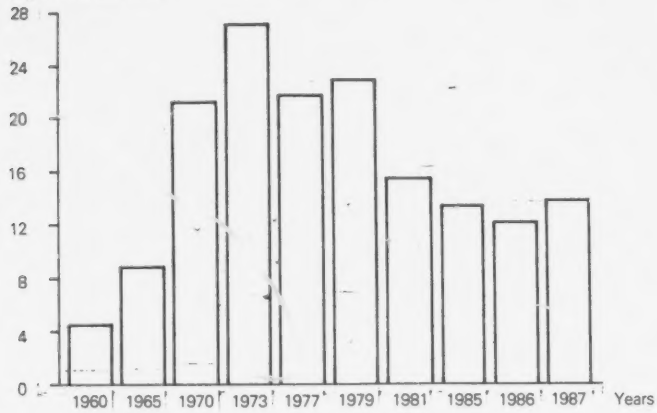
Other so called "secondary forestry products", such as bamboo, rattan, Japanese lacquer ("urushi"), mushrooms, nuts and charcoal were previously imported in raw form, but are now increasingly imported in processed form. The total volume and total value of these products are relatively low – for instance, in 1987, just over 1,500 tonnes of rattan worth less than Yen 800 million were imported. This represents a fall of 50% in value and 38% in volume when compared with 1985 figures (MAFF, 1988), and is largely due to the increased volume of imports of finished or semi-finished rattan furniture products from producing countries (the Philippines especially) or intermediary countries such as Taiwan. Disposable chopsticks ("waribashi") are mostly made from imported white softwood from coniferous plantations.

In conclusion we can say that during the 1960s and the greater part of the 1970s, mainly tropical logs were imported. This was largely because it was easy to import logs, and because this allowed control of a longer chain of processing/trading activities in and out of Japan. However, this is not a prerequisite of Japanese markets. If traders are unable to control raw material imports, they will import processed goods.

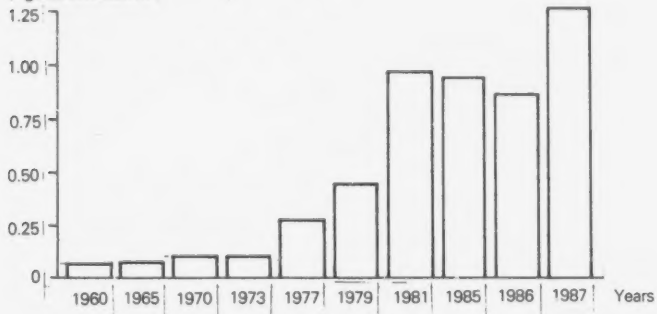
But new trends could emerge if exporting countries decide to seek control of distribution circuits in Japan, rather than remain dependent on the Japanese trading houses. Indonesia very recently took this decision in relation to marketing plywood in Japan (see Chapter 3). This could foreshadow another significant change in the whole timber economy.

Figure 12: Evolution of Japanese Tropical Timber Product Imports
(by Type of Products)

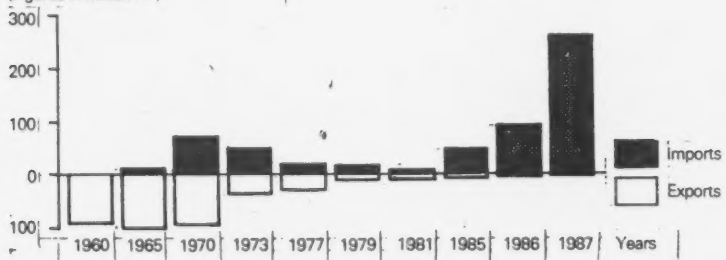
(a) South Seas Logs
(Figures in million m^3)



(b) South Seas Sawnwood
(Figures in million m^3)



(c) Plywood Imports and Exports
(Figures in million m^2)



1.3.2 Mainly Lauans?

One of the main reasons why tropical hardwood imports predominated in the 1960s was that they were not only cheap, but also consisted of very high quality timber, principally lauan. Furthermore, it was possible to import this timber in large homogenous quantities. Lauan is in fact a universal name for a variety of timber types obtained from a number of tree species, many of which belong to the Dipterocarpaceae family.

Figure 13 gives some information on the respective importance of the different types of timber being imported. In the timber trade, names do not always correspond to botanical classifications: wood names are based on the physical characteristics of the timber. It is universally common to group several botanical species under a single timber type. This is the case with mahogany, a commercial timber grouping which includes several of the best quality tropical red hardwoods, originating from very different species of trees. These range from the "historic" cuban mahoganies (*Swietenia mahoganii* – now commercially extinct), to the West African Khaya (*Khaya ivorensis* – also commercially over-exploited, which has been proposed for listing on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), (Knee and Gardner, 1989), to the Brazilian "true" mahogany (*Swietenia macrophylla*) the extraction of which has developed in the last 15 years. They also include the Philippine premium quality red and dark red meranti and lauan woods of the Dipterocarpaceae family, which were given the commercial name of mahogany, the pretext being that this was in the interest of fair competition. The US Federal Trade Commission accepted this claim in 1931.

In the case of the Dipterocarpaceae, many botanically distinguishable species have nearly undistinguishable timber qualities. However, among the hundreds of species in the family, some important groups can be distinguished. Some of these provide the bulk of Japanese tropical timber imports. But the Japanese customs services nevertheless record "lauans and apitongs" as one category. Teak is the only other significant hardwood tropical timber that is recorded separately. Softwoods are clearly distinguished from one another whether these be firs, spruces, pines, cypresses, hemlocks, etc.

Consequently, one has to rely on export statistics in order to get a picture of the structure of the trade by species (see Figure 13). The data presented is not totally reliable (due to smuggling, false declarations, uncertainties and errors), but it still gives a fair indication of the situation, and clearly shows the importance of a limited number of species or groups of species. Generally, timber types are classified according to their weight (light or heavy), which is often correlated with their workability and durability, and according to their grain, appearance and colour.

In the Philippines, the two commercial categories which constitute the majority of total lumber exports are the red or dark red Philippine mahogany – mostly red lauan, and other minor types of timber such as tanguile – and light red Philippine mahogany – mostly white lauan and other minor species such as mayapis, which is almost indistinguishable from white lauan proper. Red and white lauans account for around 90% of the Philippines' lumber exports.

In Sabah and Sarawak, the serayas are a grouping of Dipterocarpaceae species, commonly divided into white, yellow and red categories. They are very close to merantis and lauans and particularly suitable for peeling for plywood processing. As shown in Figure 13, these make up the bulk of log exports. Keruing, kapur and selangan batu are also commercially important species in Sabah and Sarawak. Meranti is another name given to a similar group of commercially exploited Dipterocarpaceae, especially in Indonesia and Malaysia. Dark red meranti (DRM) is a reference type timber and very close to the red lauans of the Philippines.

Japanese traders are always in search of species which could be used for specific purposes, particularly plywood manufacturing. They are continuously experimenting, for example with okoume and sipo, the two main commercial species in Gabon. Currently, these woods are mostly exported to France and other Mediterranean European countries for plywood manufacturing.

A great deal of discussion centres on the question of diversification of internationally traded species by using the so-called "lesser-known species" (LKS). The ITTO for instance places great emphasis on this issue. More diversified tree harvesting would allow for more cost-effective use of logging equipment, and could limit the extent to which virgin or old secondary growth forests are "creamed off" for a few valuable species at a high economic, social and environmental cost. The FAO, some forestry departments and timber trade associations have drawn up lists of potentially commercial LKS. But the promotion of LKS would make sense only if it was accompanied by the development of sustainable forest management systems. Otherwise it would merely enable loggers to increase the number of trees they extract, without ensuring conservation of the forest resource.

Figure 13 – Main Tropical Timber Species Traded Between Southeast Asia and Japan

Names	Characteristics
Seraya red (<i>Shorea pauciflora</i>)	Dark red-to-brown wood, close to dark red Meranti – exports from Sabah (logs: 2.8 million m ³ ; sawn wood: 0.4 million m ³) and Sarawak. Used for plywood.
Seraya white (<i>Parashorea malaanonan</i>)	Pale straw-coloured wood from large trees – slightly interlocking grain. Used for plywood – exports from Sabah (logs: 1.68 million m ³ ; sawn wood 0.1 million m ³) and Sarawak.
Seraya yellow (12 <i>Shorea</i> spp.)	Yellow meranti, general purpose, utility timber used for plywood. Exports from Sabah (logs 1 million m ³); Sarawak (the three Serayas account for 4.9 million m ³ in log exports); and Indonesia (sawn wood 0.5 million m ³).
Keruing (<i>Dipterocarpus</i> spp.)	Around 70 species of dipterocarpus, generally pinkish-brown to dark-brown wood with straight grain. A heavy wood, used for plywood and construction. Hill Keruing more researched. Exports from Sarawak (logs 1.1 million m ³); Sabah (logs 1.2 million m ³ ; sawn wood 0.1 million m ³); and Indonesia (sawn wood 0.13 million m ³).
Kapur (<i>Dryobandops</i> spp.); <i>D. aromatica</i> in Peninsular Malaysia; <i>D. lanceolata/becerii</i> in Borneo)	Reddish-brown wood; large trees; heavy and durable timber which can be used outside, good for high durability plywood. Exported from Sarawak (logs 1.66 million m ³); Sabah (logs 0.93 million m ³); Indonesia; and Peninsular Malaysia.
Ramin (<i>Gonystylus</i> spp. mostly <i>G. bancarus</i>)	Smaller tree found in peat swamps and low hills. White, pale yellow wood with nearly straight grain, easy to work in joinery and mouldings. Exported from Sarawak (sawn 0.15 million m ³); Sabah; and Indonesia.
Selangan Batu (Balau) <i>Shorea</i> mostly, but also <i>Hopea</i> spp. and <i>Upune</i> spp.	Light timber and for plywood – exported from Sabah (logs 0.63 million m ³ ; sawn wood 0.2 million m ³); and Sarawak (logs 0.48 million m ³).

Other important species are merbau (*Instia palempanice*) from Borneo; Apitong (*Dipterocarpus glendiflorus*) and Philippine red lavan (*Shorea negrosensis*) also called mahogany from the Philippines; white lavan (*Pentacme contorte* mostly); teak (*Tectone grandis*) now very rare, from Burma, Indonesia; taun from Papua New Guinea; nyatoh, etc...

(all figures are exports from the country, not necessarily to Japan).

1.3.3 New Trends Emerging; or "Business as Usual"?

Since the mid-1970s and more especially, since the economic recovery period which began after the mid-1980s, new forces have been at work which have transformed the Japanese tropical timber trade.

Firstly, there has been a relative decrease in tropical logs within the total volume of imports and it is likely that this will continue, irrespective of timber consumption.

Secondly, there has been a change in the structure of tropical timber imports. Previously nearly wholly log-based, they now consist of a mix of logs, sawnwood and plywood. In view of the comparative costs, lower trade barriers and growing industrial and marketing expertise of countries such as Indonesia, it is highly unlikely that Japan will regain all of its previous share of the processing market. In the medium term, some of the major remaining log suppliers can be expected to ban such exports and concentrate on processed timber. According to the Japanese daily timber trade newspaper, the prospect of a Sabah log export ban was recently discussed by SEALPA (Nikkan Mokuzai Shimbun, 1988c).

Thirdly, importers are switching from one source of supply to another as each source becomes depleted in turn. This brings us to more long-term considerations. **There is less and less virgin forest in Southeast Asia and the Pacific region, and secondary growth is exploited much too fast, resulting in the production of lower quality timber.** Additionally, secondary forests are increasingly encroached upon by other types of land use.

Finally, one ought not to forget that the increase in the domestic timber consumption of producer countries will be considerable. The prices of semi-processed and processed timber products exported from these countries are likely to increase, since there will be a demand for this kind of product at world level (especially from Europe and the Middle East, which will compete with Japan's own demand), and producer countries are likely to limit their exports to high value products.

Chapter Two: The Role of Tropical Timber in the Japanese Wood Economy

Timber use in Japan can be divided into two stages: intermediate use (at sawmills, plywood mills and pulpmills) and end-use (construction industry, paper manufacturers, furniture makers, etc). Plywood manufacturing (the major use of imported tropical hardwood) and construction (the major end-use of processed and semi-processed tropical timber products) form the focus of this chapter.

2.1 Japan's Two Wood Economies

The timber economy in Japan can be divided into two regions: the "coastal timber economy", and the "inland timber economy". The coast, home to most of the Japanese population and of great economic importance, is dependent on both domestic and imported timber. It is here that timber imports are landed, stocked, processed and largely used. Domestic timber is extracted from Japan's considerable forest reserves (250,000km², or 68% of the country). Some parts of the reserves are hardly used for commercial timber, since they are situated above narrow ribbon valleys falling steeply towards the sea. Population is shrinking and ageing in these valleys, making it difficult to recruit foresters. Numerous small sawmills dot these valleys.

The structure of the timber industry in these two areas is very different. Ownership of the forests in the "inland" area is of several types. There is an extremely fragmented private sector and a large National Forest, as well as prefecture and municipal forests of various sizes. Forestry costs are very high, despite large subsidy programmes. The timber importing business, on the other hand, consists of large trading houses interested in commodity dealing, distribution circuits, and processing industries. Processing industries need to secure volumes of homogenous raw material regularly, and as cheaply as possible.

Box Six: Distribution of Timber Products in Japan

Figure 14 is a simplified representation of the main distribution channels of timber and products manufactured from North and South Seas timber.

On leaving the importer's yard or pond, there are several possible routes for timber distribution. Most timber is imported through a trading house, although some plywood manufacturers import logs directly. 87% of the tropical hardwood used in plywood manufacturing is transferred directly from importer to manufacturer. For sawmills the figure is just under 40%, since they rely on wholesalers to a greater extent.

Wholesalers and retailers are less important now than in the past. They control 47% of the total volume of logs and supply sawmills with 53% of their stock (down from the 60% of a few years ago). They supply plywood mills with a mere 5% of their stock. Plywood mills generally deal directly with the trading houses for all their distribution operations – both for raw material supplies and sales of their finished product. In this context the function of retailers is very small since they tend to concentrate on specialized market niches.

Lumber auction markets and distribution centres do not play a major role in the distribution of imported logs. They are, however, very important in the distribution of domestic logs, sawn timber and plywood.

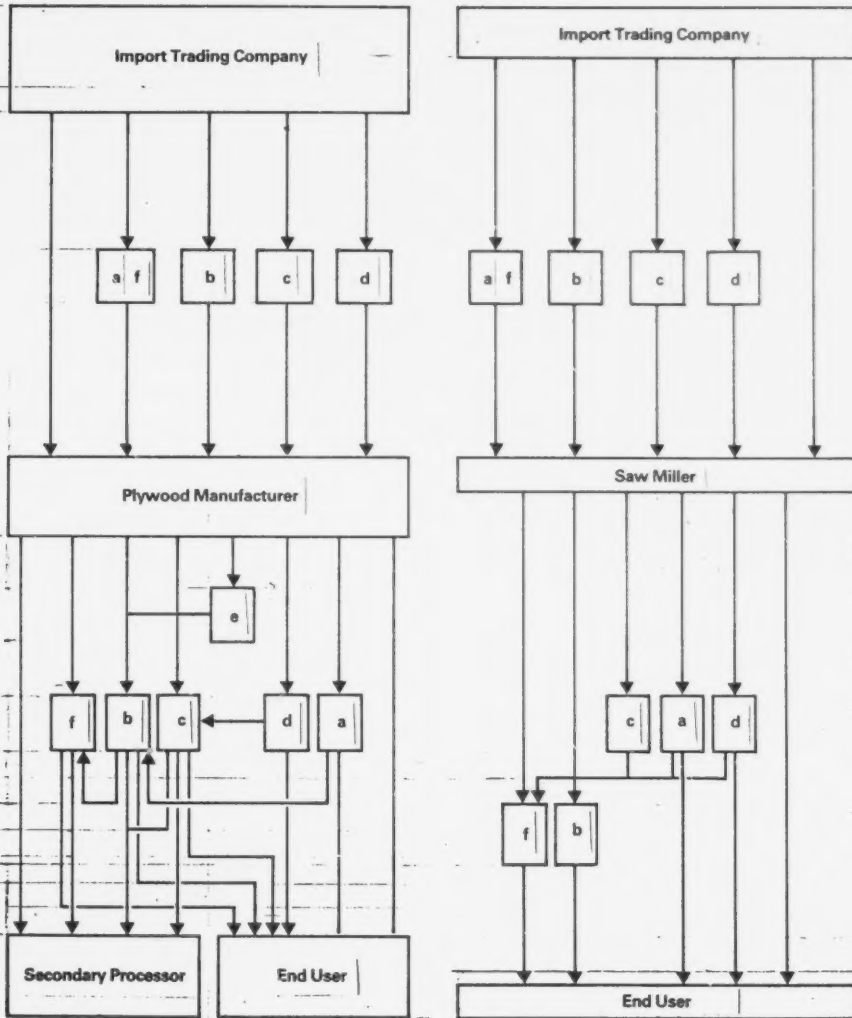
The distribution of domestic timber is quite different. The same channels exist, but direct sales from forest owners and loggers to sawmills (a number of which are owned by forest owners), wholesalers and lumber auction markets are much more important.

Common plywood (ie plywood with no further surface processing) has two ultimate destinations: end-usage or secondary processing. Secondary processing transforms approximately 30% of common plywood into "speciality" plywood (see next section). Plywood manufacturers sell 71% of their output to trading houses (who then distribute it), 21% to wholesalers, 3% to end-users and 2% to secondary processing firms. Retailers provide 76% of end-users' common plywood requirements and 41% of secondary processors' supplies.

Sawmills sell their output to a number of sectors. In decreasing order of importance they are: end-users (mostly builders), wholesalers, retailers, lumber auction markets and timber distribution centres.

The principal players in the distribution of tropical hardwood products are the trading houses, or sogo shosha (whose economic role is discussed in Chapter 3), and the wholesalers. There were nearly 4,900 Japanese wholesale companies in 1984, many of them relatively small in size and half of them with a turnover of less than Yen 100 million. Kokoku Housing, Marukichi, Marumasu Veneer, Marutama Industries and Nippon Veneer are some of the major wholesalers.

Figure 14: Distribution Channels of Imported Logs



a Lumber Distribution Centre
 b Retailer
 c Wholesaler
 d Lumber Auction Market
 e Trading Company
 f Others

Note: Approximately 70% of the Import Trading Company's output goes to the plywood manufacturer, and 30% to the saw miller.

2.1.1 The Plywood Industry

Plywood manufacture began in Japan in 1907, using domestic broadleaved timber to make tea chests (JPMA, 1987). In 1921, lauan started to be imported from the Philippines, but it was not until 1951 that the quality began to improve with the introduction of hot-press machines. Domestic demand then increased and Japan even started exporting plywood to the US. Between 1955 and the end of 1960's Japan exported one-third of its plywood production to the US. Exports reached a peak of 162 million m² in 1968 and then declined as domestic demand increased. Moreover, Taiwan and Korea had by then replaced Japan in the US market.

Housing starts are generally linked to economic growth and plywood demand is in turn linked to construction. This explains the annual increase in plywood demand of around 30 million m² during the period of high growth in the 1960s. The dollar crisis in 1971 interrupted this trend, but the real fall did not occur until after the oil crisis when overall demand declined sharply.

Plywood Manufacture

Plywood is a wood panel made up of an uneven number of thin layers of veneer glued together with their grain crossed at right angles. In Japan this product is known as "common plywood". **In 1986, 96% of all Japanese plywood was made from lauan wood, and the remainder from domestic timber.** Production is divided between thin plywoods (less than 3mm, around 42% of total production), medium thickness plywood (3mm to 12 mm, around 29% of production) and thick plywood (over 12mm, 29% of production). The last category is becoming increasingly important, since the demand for plywood as a construction material is growing. Thick plywood (the so-called kon-pane, or concrete panel, is the main use for this type of plywood) is often required, and as a result the average thickness of plywood produced in Japan has increased from 5mm in 1970 to 6.3mm in 1986 (JPMA, 1987).

If common plywood undergoes secondary processing it becomes "speciality plywood". The two main processes involve either bonding a print of a pattern (on paper or thin plastic sheet) that imitates the wood grain of highly valued Japanese trees (eg akita, sugi), or glueing a thin layer of veneer of an expensive wood onto the external face of a piece of common plywood. These two types of speciality plywood, printed and veneered, represented 36% and 19.5% respectively of the total production in 1986. Other speciality plywoods include PVC- or polyester-coated plywoods.

Wood-based panels other than plywood are not widely used in Japan. This is in direct contrast to the situation in the US and Europe. The benefit of

these products is that they permit more efficient timber usage, which means less wastage. They also have precise and constant physical characteristics. The most common types are particle board, fibreboards (insulation board, medium density board (MDB) and hardboard), reconstituted wood panels and sandwich board.

The manufacture of plywood in Japan is noted for its efficiency and the high quality of the final product. For instance, JOFCA notes:

The usual recovery rate of factories which produce a mix of thin plywood and concrete-form plywood (12mm thick) exceeds 65%, and is even more than 70% in the more efficient factories (JOFCA, 1986).

Daiken, one of the major manufacturers, claims to have achieved a recovery rate (or yield rate – the percentage of the processed log volume which is found in the finished plywood) of up to 82%. These figures compare favourably with the recovery rates of between 40 and 50% achieved in many developing nations.

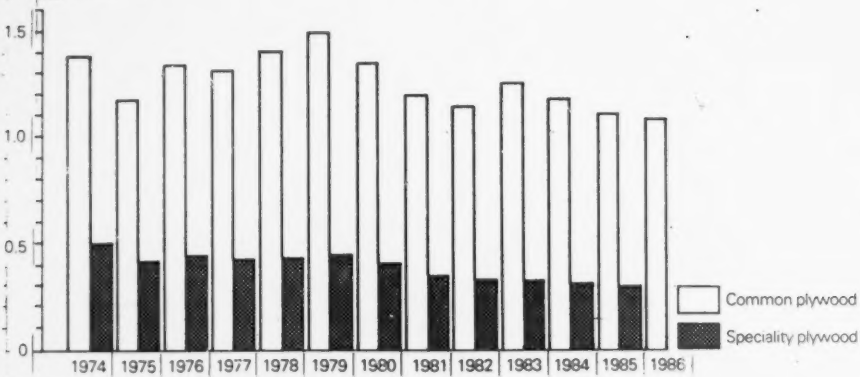
Japan has very strict standards concerning the classification of common plywoods. The main categories (Types I to III, and "Special"), are based on strength and bonding resistance. There are also special standards for plywoods with specific characteristics, eg fire retardant, kon-pane, etc. The type of bonding agent used for glueing the layers of veneer (melanine or pure urea resin, blended urea or casein) and the quality of processing determine the type of plywood, while its grade depends on wood quality, appearance and the workmanship on the external faces. Grade 1 is superior to Grade 2 since it has fewer knots, a smoother grain and less worm holes (JETRO, 1988).

Plywood Production

In 1986 there were 550 plywood and veneer mills in Japan, 200 less than in 1974 (see Figure 15). Most of the speciality mills are small workshop firms which undertake particular jobs for the industry, whereas the far less numerous multi-plant firms often produce both common plywood and speciality plywood. The total workforce has also fallen: from 74,790 in 1973 to 32,800 in 1985 (Handa, 1986).

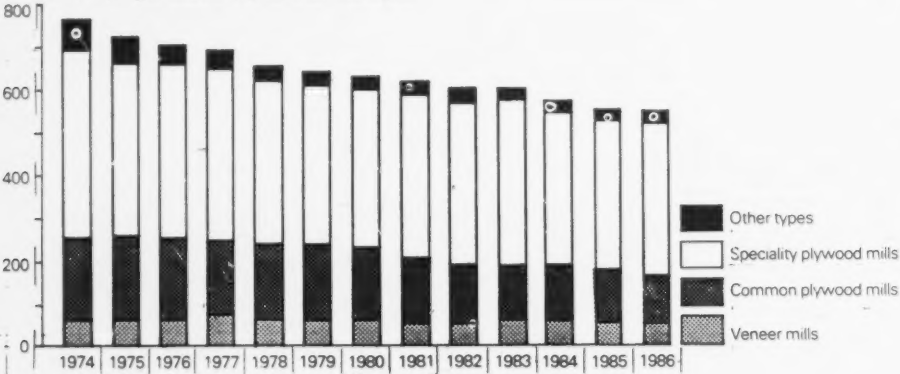
Most of the plywood factories tend to be independent concerns. However, as is the case throughout the industrial sector in Japan, they have ties with the trading houses (sogo shosha) at different levels. Sogo shosha import most of Japan's tropical timber, and supply manufacturers with 87% of their log requirements. They also control the distribution of 71% of the output of plywood mills and can provide credit and capital facilities. In the case of large plywood manufacturers, members of staff may visit tropical countries to assess log quality and perhaps place the first few orders. The sogo shosha will then be relied on in most cases for regular supplies.

Figure 15: Plywood Production and Mills in Japan 1974-1986

(a) Plywood Production in Japan
(Figures in million m³)

Note: Volume of speciality plywood should not be added to the volume of common plywood.

(b) The Decreasing Number of Plywood Mills in Japan



(c) Average Yearly Production Capacity in Common and Speciality Plywood Mills

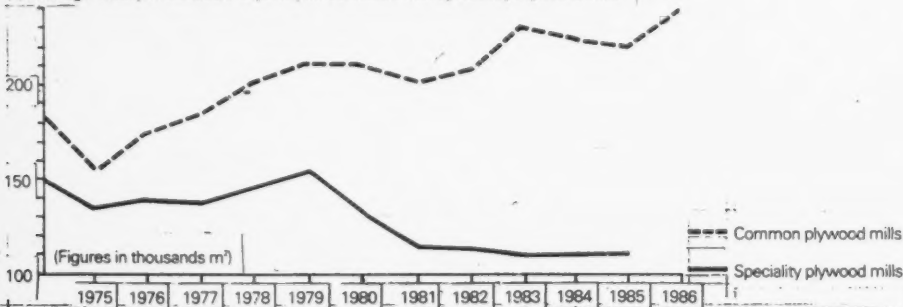
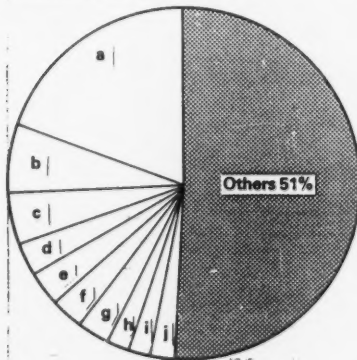


Figure 16: Some Typical Plywood Manufacturing Companies in Japan

A Large Multi-Companies Group Seihoku Veneer Group				
Name	Hokusei Plywood	Hokuyo Plywood	Toyo Gohan	Akita Plywood
Affiliation	Seihoku Veneer Group	20% Seihoku Veneers, 18% Akita, etc	Mostly Seihoku Group, but also Tomen, Kawasaki Steel, etc	Seihoku Veneer Industry & others (45 in total)
Main log suppliers	65% sogo shoshas, 35% wholesalers	Marubeni: 28%, Nichimen: 17%, Azana: 18%, etc. Sabah supplies 70%, Sarawak 30%	All logs supplied by sogo shoshas, mostly Marubeni, C. Itoh, Meiwa, Nosaki, 40% from Sabah, 60% from Sarawak	70-80% from sogo shoshas, mostly C. Itoh, Nashu, Meiwa, 70% from Sarawak, 30% from Sabah
Main 1987 products	Yen 5.3 billion sales, mostly construction concrete forming plywood	Yen 15.5 billion sales, 70% concrete forming plywood	Yen 10.7 billion sales, 60% thick (9mm+) plywood	Yen 16.5 billion sales, 70% concrete forming panels and some flooring panels
Capacity/Facilities	142 employees, 2 plywood plants in Tokyo, using 135,000m ³ logs per year	441 employees, 2 plywood plants, using 370,000m ³ logs per year	320 employees, 2 plywood plants in Akita, using 250,000m ³ logs per year	380 employees, 2 plywood plants, using a total of 425,000m ³ of logs per year. Plants in Akita
Main distribution	Entirely bought by Seihoku Group itself	All wholesale by sogo shosha (C. Itoh: 50%, Sumitomo: 15%, Marubeni: 15%, Nissho Iwai: 5%)	All wholesale by sogo shosha (Nissho Iwai: 29%, C. Itoh: 24%, Sumitomo Construction: 11%, Mitsui)	Saks in Tokyo, north of Honshu, Hokkaido. 100% wholesale to construction firms (C. Itoh Construction, Nissho Iwai, Vasutaku Construction)
Specific points	Aims to get out of concrete forming ply making and to move towards higher added value products	Plans to use smaller-diameter logs with rest of group	Part of Seihoku Group only since 1982. Seeks increase in efficiency to resist imports competition	Leader in use of small-diameter logs and resin-coated plywood; uses softwood from USA/ USSR

(b) The Main Producers of Plywood in 1985
(Production figures in million m²)

	Production	% Share
a Seihoku Group	213	19.0
b Noda Group	73	6.5
c Dantani Group	50	4.5
d Eidai Group	34	3.0
e Yuasa Sangyo	34	3.0
f Nisshin Group	34	3.0
g Daiken Group	34	3.0
h Hayashi Veneer	28	2.5
i Okura Kogyo	28	2.5
j Juken Sangyo	22	2.0
Others		51%

Note: In 1984 the market share of the above companies was 47.9%

A Large Single Company

Two Medium-Sized Firms

A Small Company

Name	Daiken Kogyo Corp.	Wakayama Manufacturing Corp.	Sumirin Plywood Corp.	Sakai Plywood
Affiliation	Part of the stock held by Sumitomo & C. Itoh. Affiliated to C. Itoh & to DKB Group	A family-owned company	Largely owned by Sumitomo Group (57% Sumitomo Ringho, 18% Sumitomo Housing etc)	Family concern
Main log suppliers	Sogo shoshas provide 70% logs from South Seas (mostly C. Itoh, but also Sumitomo Ringyo, Tomen, Marubeni, etc) 30% wholesalers	Lauan logs supplied at 90% by sogo shoshas (Nissho Iwai: 35%, Sumitomo Ringyo: 30%, Mitsui: 18%, Yuasa Sangyo: 17%) 80% from Sabah, 20% from Sarawak	Lauan logs supplied entirely by Sumitomo Ringyo & Sumitomo Corp; mostly Sarawak origin	Buys logs from 10 companies, all wholesalers such as Daiken Kogyo (see above), Eguchi Timber, Kamichi, etc logs mostly from Sabah
Main 1987 products	Yen 110.3 billion sales, 25.3% speciality plywood; 10.1% industrial plywood; 14.7% [#] fibreboard; rest in household equipment and engineering	Yen 6 billion sales, 50% thin plywood	Yen 7.9 billion sales, 70% concrete panels, 25% speciality plywood from choice wood	Yen 0.56 billion sales, produces high-quality plywood of various thicknesses
Capacity/Facilities	2116 employees, 3 plywood plants (Osaka/Nagoya), using 125,000m ³ logs per year	270 employees in one plant in Yamaguchi	185 employees producing 34,000m ³ plywood per year in one plant in Tokushima prefecture (Shikoku)	26 employees in mill in Nagoya, using some 10,000m ³ logs per year
Main distribution	70% production distributed by sogo shosha; 30% direct sales to large manufacturers (housing firms, specialized industries such as Yamaha)	Sales to sogo shoshas (Sumitomo, Nichimen, Yuasa Sangyo) and also to prefabricated housing manufacturers	95% of production sold through Sumitomo companies, mostly around Osaka	50% of sales through Kanematsu Gosho and Aituchi Moku Kan; mostly wholesalers
Specific Points	One of the major producers, mostly in speciality plywood. Very efficient (up to 82% yield)	An independent company, which mostly serves the construction industry	Proportion of speciality plywood production is increasing, especially painted concrete panels	Old company (1928) mostly producing 'hand made', high-quality plywood. Has specialized relationship with wholesalers

Figure 16 summarizes the main features of typical plywood manufacturing firms. The Seihoku Group, a group of several affiliated manufacturers (four of them are presented in Figure 16) dominates plywood manufacturing in Japan, and is an example of a large concern that deals with several sogo shosha but which is not tied to any of them. Other large firms, eg Daiken, are usually "affiliated" (linked but not owned) to a sogo shosha (in this case C Itoh) but are able to acquire supplies from other trading firms, and in the case of Daiken, sell to over 2,000 firms. A typical case would be a medium-sized firm which generally depends upon one or a limited number of trading companies, or which is a subsidiary of a larger organization. Small companies are mainly speciality manufacturers indirectly dependent on trading houses as suppliers of raw materials, distributors of finished products, or for financing.

Plywood mills tend to be concentrated in coastal areas and in particular in two regions of Honshu: the Kanto area (near Tokyo), and the Kansai area (centred on the Osaka-Kobe-Kyoto triangle). The Kanto region is dominated by a few big manufacturers, while Kansai is home to a large number of small plywood mills.

The largest common plywood manufacturing concern in Japan is the Seihoku Group (North West Group) based in the Kanto and Tohoku regions of Honshu. It has around 20 affiliate companies including Seihoku Gohan ("plywood") Kogyo ("industry"), Akita Gohan, Seihoku Veneer Kogyo, Toyo Goyan Kogyo, and Hokuyo Gohan. In 1985 the Seihoku Group produced 19% of all common plywood in Japan (Yano Research Institute, 1987), and is said to control 60% of the market in the northern regions.

The Noda Group (second largest plywood producer in Japan, with 6.5% of national production in 1985) and the Nisshin Group (3%) are two of the other large companies in the Kanto-Tohoku areas. In the Kansai area, the three largest manufacturers are the Daiken Group and Eidai Sangyo (both accounted for around 3% of the national plywood production in 1985) and Hayashi Veneer (2.5% in 1985). Other groups include Yuasa Sangyo (which produces 3% of Japanese plywood) based in the Tokai area, just south of the Kanto region and the Dantani Group (the third largest producer in Japan with 4.5%), based in the southern regions of Kyushu and Chugoku (see Figure 16b).

Plywood manufacturers have been having a rough ride since the early 1980s. They were badly affected by the economic crisis and the slump in the construction industry, as well as by increases in lauan prices at the end of the 1970s (see Figure 11a). Several companies went bankrupt, and as a result the government launched the "Emergency Project for the Re-organization of the Timber Industry" through the Forestry Agency in 1982.

This was aimed at reducing over-capacity in the timber industry and subsidized the interest on loans taken out for re-organization and rationalization.

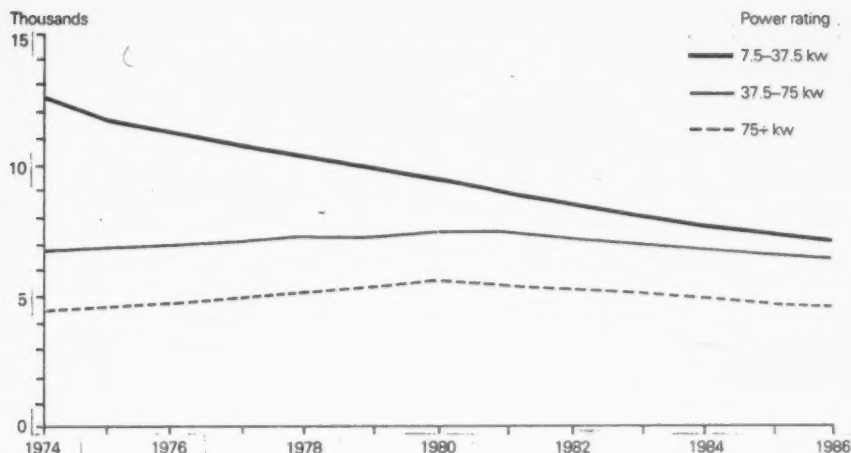
However, the situation did not improve significantly, and plywood manufacturers and the timber departments of trading houses continued to sustain considerable losses. The bankruptcy of Shin Asahigawa, a leading plywood group, "came as an enormous shock to the trading houses as a whole" (Asian Timber, 1986b). Furthermore, the government had just agreed to reduce import duties on foreign plywood.

A new support programme – the "Five Years' Plan for the Reactivation of Timber Processing Industries" – was implemented in November 1985 by the Ministry of Agriculture, Forestry and Fisheries (MAFF). This allocated US\$75 million for direct expenditure and US\$300 million for loans, and included the plywood industry. The plan encompasses the promotion of timber usage and restructuring of the timber processing sector, particularly the

Reduction and abolition of existing production facilities for plywood and sawn timber manufacture, to meet with the actual demand for these products considering the future increase of imports from foreign countries (JOICA, 1986).

Trade structure has changed completely. Plywood imports have increased and the Indonesian plywood marketing body (APKINDO) set up a new company – Nippindo – in Japan based in Osaka. This is now the exclusive distributor of Indonesian kon-pane plywood (Nikkan Mokuzai, Shimbun, 1988d). These changes will seriously affect the future of the timber departments of trading houses and plywood manufacturers alike.

Figure 17: The Decline in the Number of Small Local Sawmills in Japan 1974-1986



2.1.2 Sawmilling, Laminating and Flooring

Figure 17 shows the number of sawmills operating in Japan from 1967 to 1986, and their power ratings. In 1986 there were 18,260 sawmills with a total power of 1.3gW, a marked decline from the 24,230 mills of 1960 (with a total power of only 0.6gW).

In 1986, the breakdown of numbers of mills by power rating was as follows: 38% from 7.5 to 37.5kW; 52% from 37.5 to 150kW and 10% above 150kW. Sawmills have been affected by Japan's economic situation in much the same way as the plywood industry. The mid-1970s saw a major change in the number of sawmills in all categories and a drop in the workforce – from 244,000 in 1960 to 140,000 in 1985.

Large sawmills tend to be located in coastal areas and to specialize in processing imported timber. Less than 22% of sawmills handled tropical hardwood logs in 1985. While most imported logs sawn in Japan are processed around the major harbours, there has been a recent trend towards imported timber (primarily coniferous) being processed in the mountainous areas, by mills which traditionally used domestic wood. The reduction in domestic production and the high costs of extracting wood from Japan's forests has meant that for many sawmills, even in the

mountains, imported logs are now cheaper than domestic ones.

Of the total volume of sawnwood used in Japan, 20% is imported pre-sawn. This figure has been increasing over the past 15 years. One of the reasons why it is not larger, is that Japan does not accept imports of sawn timber which have anything other than small discrepancies in size. Unlike other countries where dimensional finishing is applied to imported timber, Japan expects foreign suppliers to meet its own high standards. Initially this was a major problem for many producer countries trying to develop plywood processing industries, but it is becoming less of an obstacle now that their standards are improving.

2.1.3 The Pulp and Paper Industry

Japan's per capita consumption of paper is among the highest in the world. In 1986 its raw material requirements for pulp and paper amounted to 21.9 million tonnes. A search for timber resources to meet Japan's pulp requirements has been taking place ever since the First World War. Despite a significant level of paper recovery and recycling, demand continues to grow. Before the Second World War, the main sources were Korea, Sakhalin (annexed in 1910) and the northern island of Hokkaido.

Pulp production was originally concentrated in the hands of two companies, Oji Paper Co and Fuji Paper Co, but by 1918 there were 16. These had all been absorbed into one national private monopoly, Oji Paper Co, by 1933. In the mid-1930s, when Japan had a quasi-war economy, Oji became the owner of the National Forest in Sakhalin from which it extracted 80% of its requirements.

At the end of the Second World War, Japan lost its colonies and the Oji Paper Co was broken down into several companies by the Americans. New supplies of pulp then came mainly from North America.

Almost half of Japan's pulp requirements are obtained by recycling waste paper and other fibre materials. Of the remaining 11 million tonnes, domestic pulp production accounts for 9 million tonnes and imports for 2 million tonnes (MITI, 1986). Canada, the US, New Zealand, northern Europe and South Africa are the main foreign suppliers. Some pulp, however, is imported from tropical countries, in particular from Brazil and the Philippines, but the quantity involved is minimal.

The 9 million tonnes of pulp produced in Japan require 31 million m³ of chips in roundwood equivalent. There are 5,132 chip making installations in Japan. The majority of them are very small and employ less than four workers. They are generally located in sawmills in order to make use of the wood waste. There are only 634 purpose-built independent chip factories in Japan and they primarily use logs rather than waste. In 1986 waste residue accounted for 6.6 million m³, domestic logs for 9.9 million m³ and chip imports for 12.3 million m³ (increasing to 14 million m³ in 1987).

In 1986, about half of these chip imports were hardwood chips. Nearly 4.5 million m³ of eucalyptus chips came from Australia where there is an increasing number of joint ventures for plantations and chipping plants. South Africa provided 0.7 million m³. It is expected that the amount of chips from eucalyptus plantations in Australia, the US, Chile and China will increase.

2.2 The Use of Tropical Timber Products in Japan

Japan has a long tradition of building with wood. It is therefore not surprising that house construction is still the main use of wood in Japan. However, construction methods, timber uses and materials are now changing very rapidly.

2.2.1 A General Picture of Timber End-uses in Japan

Two types of product are processed from tropical timber: sawnwood and plywood. Figures 18a, 18b and 19a give an overview of sawnwood and plywood uses. For all categories of product, end-uses related to construction (housing, engineering, joinery, etc) are by far the most important. For sawnwood, figures disaggregated by origin of timber are given for 1986, with a comparison between 1977 and 1986 for all sawnwood. Figures for plywood are less readily available. The most recent come from a 1980 survey (JPMA, 1981). For particle boards, 1985 figures are available.

Sawnwood

Despite the considerable fall in sawnwood consumption (shippings from sawmills fell by 25% over the last decade), end-uses have changed little. Figure 19 shows that construction used 77% of all sawnwood in 1986, just as it did in 1977. Packaging and furniture are the only two categories of use for which there have been some changes. However, packaging still fell by only 10%. Sawnwood used for furniture fell by 43%.

Tropical sawnwood is used far less in construction than the other types of sawnwood (48% as opposed to 80%). This is not surprising, since most of it is hardwood, ie high-quality material best reserved for specific hard-wearing products (packaging), or important uses (furniture). Truck and bus flooring, which require heavy tropical hardwood forms another important category, but in Figure 19 it is under the heading "Others". According to one source, this use accounts for 7% of shippings (JOFA, 1986). The same source (which bases its conclusions on a less reliable estimation by the Japan Forest Products Journal) also estimates that construction accounts for a far higher share of tropical hardwood sawn timber (60%) and packaging for a smaller share (13%).

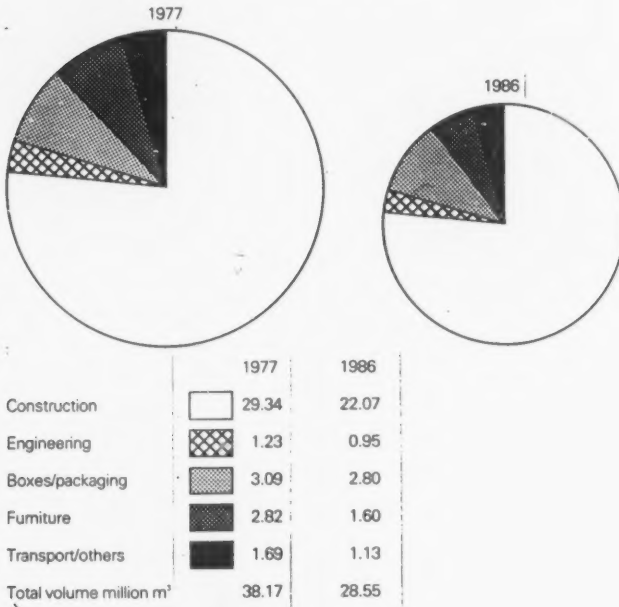
Plywood

Estimates of plywood end-uses are based on mill delivery value, rather than volume. Therefore, only a general indication of the relative proportions of the various plywood end-uses can be given. Construction (including joinery and engineering) is the main end-use, accounting (in 1980) for 55.4% of the total value of shipments. Furniture is also a major end-use at 30.2%.

Other uses, including fittings, cabinets for electrical goods such as televisions, packaging and pellets, sewing machine tables, and musical instruments, are very specialized. Some types of common plywood are likely to be used only for specific purposes (for instance scaffolding planks, which not only have specific sizes, but which also, in Japan, have their own JAS Manufacturing Standards).

Figure 18: Uses of Sawnwood in Japan

(a) Destination of Sawnwood Shippings in 1977 and 1986



(b) Use of Sawnwood by Source in 1986

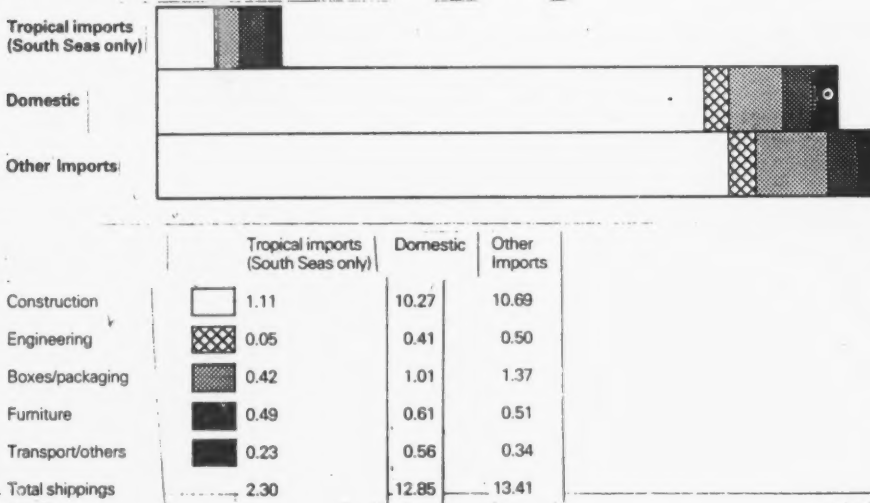
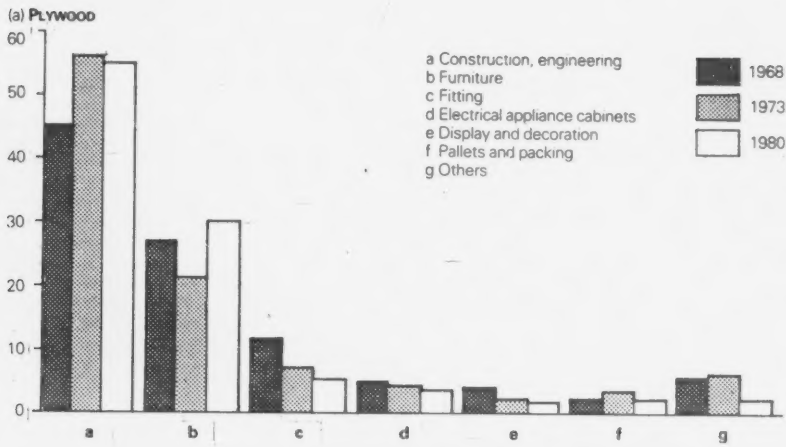
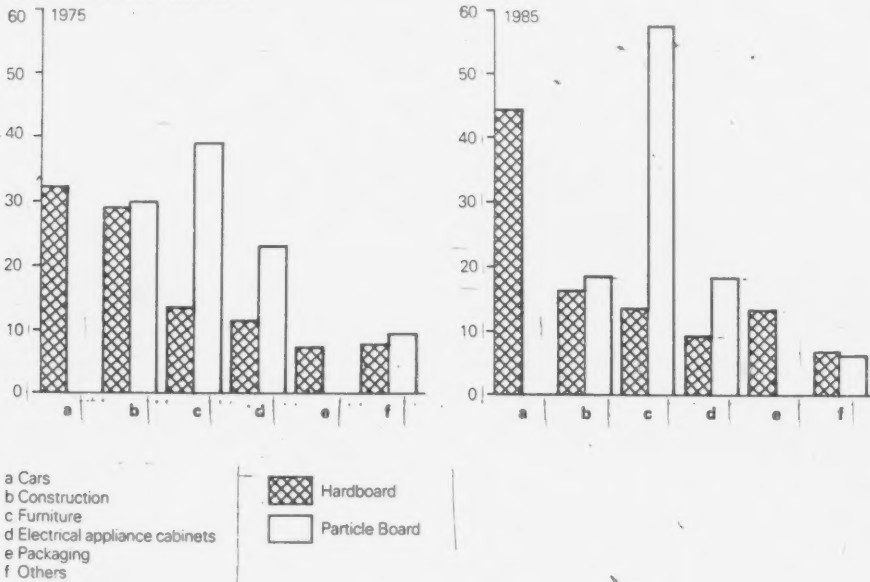


Figure 19: End-uses of Plywood, Hardboard and Particle Board
(Figures as a percentage of total delivered volume)



Note: 'Others' includes sewing machine tables, musical instruments, vessels and vehicles.

(b) Hardboard and Particle Board



Note: 'Others' includes shipbuilding and wagons, sewing machine tables, and musical instruments. Particle board excludes thin particle board. 1985 furniture includes joinery.

Figure 19a also gives data for 1968 and 1973, during which similar surveys were undertaken. It is interesting to link the growth in the level of total deliveries, the proportion of plywood used in construction and the figures concerning new building as shown in Figure 20 in the next section. All three variables peaked in 1973. Plywood established its place as a construction material at the beginning of the 1970s, largely because it was so cheap. It became one of the main materials for construction panels, and as a result a new building method was adopted. This has replaced much traditional workmanship.

End-uses of Other Panels

There are major differences between the end-uses of other boards such as particle board and hardboard, and plywood and sawnwood (see Figure 19b). Hardboard is seldom used in construction. Instead it is mostly used for panelling in cars. Similarly, particle board is not used much in construction. Its current main use is for self-assembly furniture, and other cheap modern furniture units. It is likely that end-use patterns of these materials have not yet stabilized, as their market penetration in Japan is as yet very weak.

2.2.2 Construction: the Main End-Use

In Japan, construction is the main end-use for nearly all timber products. Construction in all its forms (housing construction, as well as construction of industrial premises, offices, public buildings and engineering works) is a significant factor in the economy. At the end of 1986, the value of construction orders amounted to Yen 25.95 trillion, and in January 1988 the industry employed 5,510,000 people (Statistics Bureau, 1988).

Construction has been one of the main elements of economic growth ever since the last war. The widespread destruction of housing stock during the Second World War, together with the boom era of the 1960s and early 1970s which saw an increase in urban populations, and renovation of decaying, older housing stock, led to a huge demand for construction and raw materials. The construction industry continues to grow today, fuelled by speculation and yet further urbanization. The number of housing starts increased from 1.14 million in 1983 to 1.37 million in 1986, and then shot up to 1.67 million in 1987.

In 1986 there were 11.2 housing starts per thousand inhabitants. This figure rose to 13.7 in 1987, which was twice that of the US (6.8 in 1987), and more than double that of many European countries (4.1 in Germany, 5.3 in France).

The modern Japanese conurbations of the 1980s, and the towns of the 1930s have little in common. In the 1930s, only public and industrial buildings made use of concrete or reinforced steel structure technology. Nearly all private houses were built in

the traditional fashion – a timber frame to which plastered walls and wooden fittings were then added. The quality of the housing obviously varied according to the social class and occupation of the inhabitants, but the basic model remained the same.

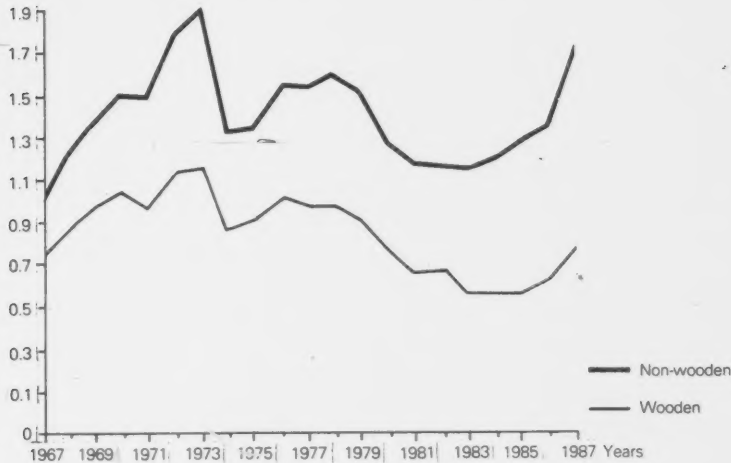
Concrete Defeats Wood

The "wooden" house in Japan, whether traditional or modern, no longer forms the basis of construction. It is too costly – land near conurbations is scarce, and therefore expensive, and the cost of materials, especially that of domestic timber, is high. New types of houses, with fewer timber components (but which still require plywood as a building tool) are now being built.

The main change in construction has been the emergence of multi-storey blockhousing in urban areas. The Japan Housing Corporation was created in 1955 to cater for mass housing. The move away from wooden housing was at first slow. But Figure 20 shows that in 1980 there was a sudden drop in the number of wooden houses being built, and that whereas the number of new non-wooden dwellings recovered fast after 1982, the number of wooden dwellings grew far more slowly. Consequently, the number of non-wooden houses, which had represented only 23% of the total starts in 1965, accounted for 56% of them in 1987. Non-wooden houses are of the reinforced concrete or steel frame type.

There are also two new types of pre-fabricated wooden house: "pre-fabricated rooms" or "framed-wall" (also called the "two-by-four"). But prefabricated houses take up only a small share of the market. Since the early 1980s they have accounted for a mere 10-13% of the number of houses built each year (JETRO, 1985a). Most of these are steel- or concrete-based. The volume of total panels for such units (made of softwood plywood from North American logs) has remained stable since the early 1980s, at between 16 and 18 million m² per year (Ministry of Construction, 1987).

Figure 20: New Housing Construction: Number of Dwelling Units by Type
(Figures in millions)



Traditional Construction

The technology used for building wooden houses in Japan has been celebrated worldwide.

Japanese carpentry is without equal.

Furthermore, the atmosphere of the Japanese traditional house is highly cherished in Japanese culture. Indeed, surveys indicate that most Japanese people want to live in such houses. The attraction of the wooden house has been described thus:

... the colour and feel of the wood pieces used for columns, ceilings and frame, as well as the feel of the tatami mats used on the floor. It is also the flexible atmosphere of a shoji or a fusuma partition which does not give a clear-cut division or boundary between the inside and the outside, or between this room or that room (JFTA, 1982).

Traditional wooden houses are built mostly from domestic coniferous timber. The perfect timber required for these has to be virtually raised by hand. (For instance, hinoki, which is used for columns, has to be devoid of knots and therefore tended regularly. All the small branches on the trunk must be cut in order to prevent irregularities in the grain.) The materials for these houses are therefore very expensive, and can only be afforded by the wealthy.

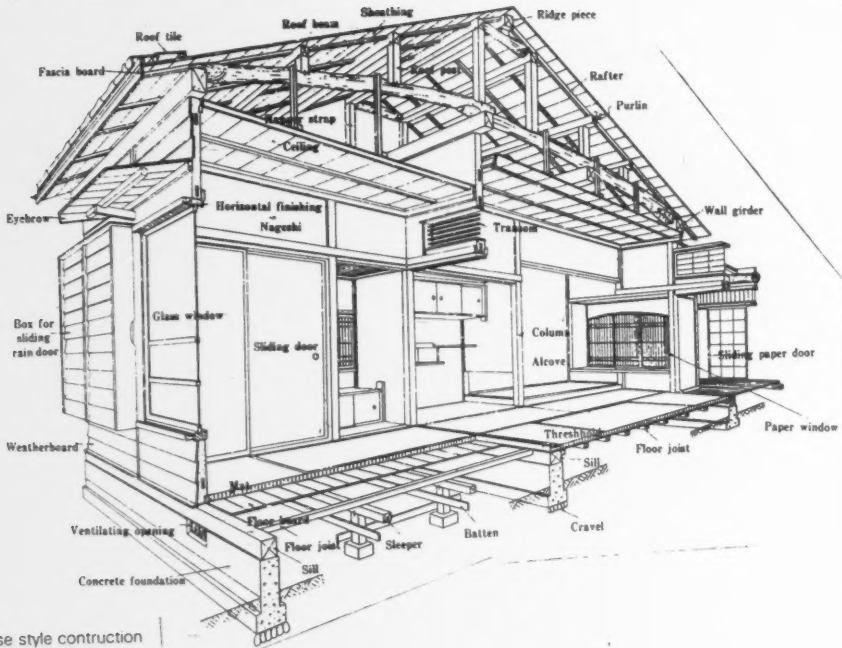
The "western" Japanese wooden house (see Figure 21) is more heterogeneous in its materials. Beams, columns, lintels and trusses are often made of pine from the US or the USSR.

Additionally, plywood is often used, albeit concealed, for ceiling and interior partitions (external walls are covered with stucco), as under-floor panels, and as faces for hollow-core wooden doors.

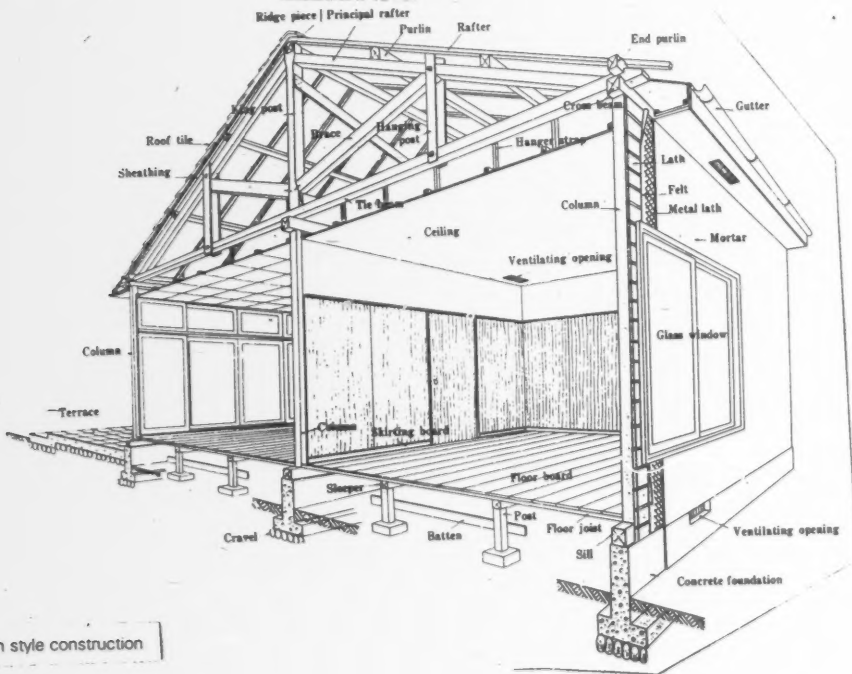
Lauan sawnwood is not used for structural purposes, but rather for joinery – parts of stairs, window and door frames, sills, etc. Other types of tropical hardwoods are used for decorative or carpentry purposes. Hardwoods such as nyatoh and merbau, and the so-called "fancy woods" ("exotic" tropical timbers, praised for their decorative value), which are relatively rare on the Japanese market and command a high price, have very specific end-uses – especially as veneers for walls, ceilings, floor panels, posts and lintels for the alcove ("tokonoma", an important component of central rooms in conventional Japanese homes), and as material for Buddhist altars ("butsudan").

Fancy woods are traded at special auctions and there are special wholesalers and retailers for their distribution. In 1978 the value of "fancy wood" timber and products was estimated at Yen 18.28 billion. This is a considerable sum for a comparatively small volume of imports. It is

Figure 21 Modern Wooden Houses in Japan



Japanese style construction



Western style construction

estimated that 49% of it is used for interior decorative materials and surfaces, 9% for Buddhist altars, 34% for furniture, 5% for musical instruments, and 3% for other uses. The market value of these finished products or materials has been estimated at Yen 170 billion (JETRO, 1980). Since then, the volume and value of fancy wood imports appear to have decreased. In 1986, the value of fancy wood logs, sawn timber and veneers was only Yen 5.64 billion, and fell again to Yen 4.44 billion in 1987 (Japan Tariff Association, 1987, 1988).

Plywood Kon-panes and Concrete Houses

In the 1960s the building trade was encouraged to use lauan plywood⁴ sheets as panels for moulding concrete to produce the so-called concrete panels or "kon-panes". Some are coated and can be re-used several times (as can metal shuttering, mainly used in civil engineering until recently). However, most are not processed for re-use, and are thrown away after one or two uses.

It is difficult to ascertain exactly what proportion of plywood is used for this purpose. According to a 1980 survey (JPMA, 1981), for every m² of floor area in new reinforced and steel-reinforced concrete buildings, 4m² of plywood was used for forming concrete; and each time, 44% of the plywood was new. The average rate of re-use of kon-pane was 2.75 times. If these data are still valid, around 135 million m² of plywood production was used for new kon-panes for buildings (civil engineering excluded) during 1987. (The data on new concrete floor area is from JPMA, 1988). If one assumes that the average kon-pane thickness is 13mm, the aforementioned quantity represents 1.76 million m³ of plywood. This in turn represents around 24% of the Japanese production of plywood in 1987. It would be reasonable to estimate that for 1987, usage of new kon-panes took up close to 30% of domestic plywood production (if one includes civil engineering uses).

Conclusions: Future Trends in Timber Usage for Construction Materials

Several factors indicate a stabilization, if not a decrease in the use of timber products in construction, except as kon-pane. The first factor is simply the increasing proportion of non-wooden houses being built. An average Japanese-style wooden house requires between 25 and 35m³ of wooden material. So if the number of new wooden houses decreases by 100,000 per year, the demand for coniferous logs should itself decrease by 4.5 million m³ and demand for plywood and sawnwood tropical logs by 1 million m³.

A second factor is that the average surface area of newly built dwellings stopped growing, and since 1982, has actually dropped significantly. It grew from 58.9m² in 1965 to a peak of 93.9m² in 1982 – a gain of 60% – but then fell back to

79.2m² in 1987 (calculated from Ministry of Construction, 1988a, and Handa, 1988).

This decrease is particularly noticeable in non-wooden housing. It can be calculated from the same official statistics (Ministry of Construction, 1988a) that the average surface area of new steel frame dwellings fell from its peak of 98.2m² in 1980, to 67.7m² in 1987, and that that of new reinforced concrete-built dwellings has fallen by a similar amount – from 79m² to 60.5m² over the same period, a figure unmatched since the mid-1960s. The fall in the average area of wooden housing starts has been less noticeable than that for non-wooden houses – from 101.2m² in 1982 to 96.5m² in 1986, and even creeping up to 97.6m² in 1987.

The earlier trend towards more spacious modern dwellings, as opposed to the old traditional semi-rural housing or cramped tenements, is obviously being reversed. Japan – like many countries – has a growing need for small modern dwelling units for smaller families. But the main reason for smaller dwellings is the recent change in the structure of ownership for non-wooden dwellings. A recent White Paper on construction, referring to the situation in the Tokyo region, summarized this as follows:

Despite soaring land prices, housing construction has been undertaken in the Tokyo Metropolis Region. A considerable number of relatively small-scale, rented houses have been built, partly stimulated by lower interests rates on housing loans and preferential treatment in the tax system (Ministry of Construction, 1988b).

Statistics clearly show that since the economic crisis at the start of the 1980s, new private owner-occupied dwelling construction levels and public sector housing starts have stagnated (despite a small increase of construction starts in 1987). It is mostly in the private rented sector that construction starts have increased – from 187,000 units in 1982, to 741,000 units in 1987 (equal to 45% of all dwelling construction starts). This speculative trend is mostly concentrated in urban areas, where an accommodation shortage has been compounded by the land price crisis. Most of the new rented dwellings are in tower blocks. They are very small so that as many people as possible can be accommodated. Such housing uses little wooden material – apart from kon-pane – during construction.

2.2.3 Furniture and Other End-Uses

Furniture manufacturing is the second-largest sector in the use of timber such as sawnwood and plywood. As shown in Figures 19 and 20, a higher proportion of tropical (South Seas) sawnwood and plywood is used in furniture making, than of any other type of wood product (such as domestic timber), or imported coniferous timber (from the US and USSR).

Around a third of tropical sawnwood, and 21% of plywood shipments are used in this sector, as opposed to less than 5% of domestic sawnwood and less than 4% of other (non-tropical) imported sawnwood. The modern Japanese furniture industry has to cater for two different categories of product, with very different traditions, namely the Western and the Japanese. Japanese-style furniture is mostly home-based, for use in tatami mat rooms, whereas the Western-style "legged furniture" is for use both in the home, and in public spaces (offices, restaurants etc).

Western-style Furniture

Western-style furniture did not become popular in Japan until the 1950s:

In particular, the emergence of multi-story apartment buildings built by the Japan Housing Corporation (established 1955) primarily for wage-earners proved (to be) the turning point for the spread of legged-furniture. This stemmed from the fact that non-tatami mat rooms (ie Western-style rooms) were adopted in the layout of such publicly funded housing. Furthermore, the increasing number of people working and travelling abroad provided added impetus to the rapid Westernization of the Japanese lifestyle (JETRO, 1986).

It is now customary to have a mixture of the two furniture styles, sometimes with one room in the Western style, and the rest of the house in the Japanese style. Western-style furniture is often found in living-rooms and bedrooms in the home, and accounts for most of the furniture in offices and public spaces. Most of this furniture is manufactured in Japan. Furniture imports represent less than 3% of shipments. The main imports are from the Philippines, Thailand, (including rattan furniture) and Taiwan (JETRO, 1986).

Japanese-style Furniture

The most important pieces of Japanese-style furniture are those used for storage. These include cabinets, wardrobes (for instance marriage wardrobes) and chests (such as the "wa-dansu", the traditional chest of drawers). The small surface area of Japanese rooms and the aesthetic preference for uncluttered space demand such furniture. The low table ("zotaku") and desk are other important pieces.

The Japanese furniture manufacturing industry consists mainly of very small firms; even more so than other timber-based industries. In 1985, when the most recent industrial survey was carried out, 45% of furniture makers employed a maximum of 3 persons, and 78.5% a maximum of 10 persons. Of the 12,428 manufacturing firms, employing a total of 1.57 million people, only 135 had more than 100 employees (Japan Wood Reserve Organization, 1988).

The larger furniture makers buy processed timber for manufacturing, but also logs, as they often have their own sawmills. In 1987, they bought 1.216 million m³ of wood material: 69% of it was sawnwood, 5% laminated timber and 26% logs (Japan Wood Reserve Organization, 1988). The furniture industry uses nearly 58% of Japan's production (which is small) of particle boards, but only 30% of its plywood production.

The tropical hardwoods used for furniture making or finishing, vary according to the type of furniture being produced. The use of a particular species depends on two factors – its price (which in turn depends on supply and scarcity; a rare timber such as teak cannot be used merely for core panelling) and fashion. In general terms, light yellow, white or red woods, rather than dark red or brown woods, are favoured. In the manufacture of chests, lauan or jongkong is used mostly for core plywood in panels, whereas more refined tropical hardwoods, with a complex grain structure, such as nyatoh or teak, are used for veneer surfaces. For tables and chairs, more core wood is used, and nyatoh, for instance, is used as a core wood as well as for veneer. Matoa and rubber wood are used for chairs and table legs.

The main types of tropical timber used in the furniture industry, are lauan, nyatoh, teak, ramin, and jetulong (JETRO 1986). Matoa, rosewood, rubber, karin, perupok, ebony – all Southeast Asian species – are also used. Makore is the only African species of any significance in this sector.

(Japan Wood Reserve Organization, 1988).

As in any other country, the Japanese furniture industry uses materials other than wood as a basic material. In 1986, wood accounted for 45.4% of the total material value of home furniture, but for only 35% and 18% respectively of that of public buildings and office furniture. On the other hand, other "wooden" materials such as plywood, fibreboard, and particle board, are used less in home furniture than in office furniture (where it accounts for 66.3% of basic material value) (Japan Wood Reserve Organization, 1988).

2.2.4 Patterns of Demand and Economic Activity

Demand for timber, and the development of specific timber uses, are dependent on two factors: the general economic climate, and the substitution of competing materials when relative prices, availability and security of supply alter. The impact of government support programmes and trade policies also influences, albeit indirectly, the levels and patterns of demand for particular timber products.

Additions to existing timber supplies and the substitution of new timber products for old ones has occurred several times. The sudden irruption of imported logs into domestic production during the 1950s and 1960s, was particularly important. Similarly, the wide acceptance of plywood as a construction material signals a complete change in construction techniques and craft traditions. In effect this was promoted by traders and professional bodies.

Industrialists and traders are well aware of the changes that will result from the new trends. These include the depletion of much of Southeast Asia's commercial timber resources; the continued price advantage that logs and processed softwood products from North America have over Japanese domestic timber in Japan itself; changes in the types of homes and dwellings being built; and technological developments in Japan and overseas which allow for a more flexible choice of materials in furniture making and joinery. The general reaction has been to accept that changes in supply patterns will be necessary. Most manufacturing engineers also accept that at a technical level there should be no major problems in switching from one type of raw material to another, for instance, in the plywood industry.

The concern expressed by some industrialists, traders, and civil servants (interviewed as part of the preparation of this report), in relation to the difficulty in persuading end-users and trade intermediaries to accept alternative products, is therefore groundless. End-users have already adapted to many changes, and these have often been more complex than simply moving away from one type of plywood (made from tropical hardwood) to another (made from softwood).

There are no real technical problems involved in using raw materials other than tropical logs for plywood manufacture. For years, government research institutes, as well as leading private companies, have been improving peeling and bonding technologies for softwoods. The main problem, which was the small diameter of softwood logs, was in fact resolved some time ago when machinery with the ability to peel 35cm diameter logs with little core waste was built. Leading plywood manufacturers such as Daiken and Akita Plywood are investing in these improved technologies.

Akita is already marketing softwood plywood made from Siberian logs and the largest US timber company, Weyerhaeuser, now imports coniferous logs for the same purpose. In other words, tropical timber is no longer essential. Alternative materials exist, are already in use, and are assuming a growing importance.

Part Two: Timber, Capital and Aid

Chapter Three: Bringing in Tropical Timber – Who Controls What?

The previous two chapters analysed the main aspects of the Japanese tropical timber trade. The need for change in this structure is now evident. Competition from cheap imports of processed products from tropical countries, and from the US, Canada and other temperate softwood suppliers could affect the sawmilling and furniture-making industries, and particularly the plywood industry.

A more fundamental problem will arise once commercial supplies from Southeast Asia have been depleted. Many plywood manufacturers already recognize that the lower quality and smaller size of current timber imports forewarn that usable timber stocks (for plywood manufacture) will soon be unavailable. As emphasized in Chapter 2, this does not present a technical problem for the timber industry itself. It is rather a geo-political question concerning Japanese foreign policy.

This chapter introduces the institutional and economic processes responsible for the present situation with regard to Japan. There are two main areas of analysis. The first concerns the institutional structures within the tropical timber markets in the producing countries and in Japan. The second concerns the monetary and credit flows between the exporting and importing agents.

3.1 Market Structures

The Japanese tropical timber import market is characterized by the presence of a unique Japanese corporate unit, known as a "sogo shosha". Sogo shosha are general trading houses. They are more than wholesalers and import-export companies, since they permeate most commercial and financial operations on the market and are associated with large city banks and major industrial groupings. Although the majority of their turn-over comes from domestic trading in Japan, they do have a considerable import-export role (including within the timber trade).

3.1.1 Shipping Timber to Japan

There are four key locations in the tropical timber trade: the forest, the storage yard or pond in the harbour, the cargo ship, and the storage yard or pond in the receiving harbour. A number of economic agents act at and between these locations. In the forest the logging company is the main agent. It will hold a licence – supplied by the local forestry department – for logging and extracting timber from a concession for a number of years. Once the timber has been taken out of the forest, it is either directly transported as logs to the exporting point, or goes through local processing at a sawmill, plywood or veneer mill, where it is stored.

The shipper and the agent then intervene. The shipper is not the firm which ships logs out, but simply the exporter – the company which acts as an intermediary between the logging company itself and the foreign firm which buys logs through

itself and the foreign firm which buys logs through its agents. The freight line is the next agent. It physically ships the logs (or the processed products) to the port of entry in Japan, where it is carried ashore by transfer barges, or to ponds for storage until the clients (wholesalers, plywood manufacturers) remove them.

Contrary to the situation prevailing in most industrialized market-economies, where forestry ownership is split between public and private ownership (as is the case for instance in Japan), there is very little privately owned forest in tropical countries. Forests have either come under state ownership, or (as in Papua New Guinea) they are controlled according to various community customary rights.

3.1.2 Loggers, Shippers and Agents

In most tropical countries there are two types of commercial logger: those who have small concessions, or work as sub-contractors, and those who have large concessions, and who are often associated with the export market. The impact of logging operations on forests depends on the terms of the concession licences, the ways in which these terms are enforced and how forest areas are regenerated (or at least protected) once the logging operations have been carried out.

Several parameters are of prime importance: the size of concessions and their zoning, the duration of licences, and the constraints on these licences. In respect of logging operations, licences generally limit the yield per hectare, species which can be exploited, the minimum diameter of trees which can be felled, methods which may be employed for log extraction (winching, overhead cables, etc.), – areas which may be exploited, and areas where storage areas, primary and secondary roads may be built. Other aspects covered in logging licences relate to royalties, industrial conditions (for instance, a licence may only be granted if a certain proportion of logs is processed), export conditions and duties. Sometimes conditions concerning post-logging management (enrichment planting, road maintenance, etc) are imposed.

However, logging rules are often flouted. The problem is twofold. Firstly, staff shortages make it difficult to ensure that companies adhere to concession regulations, particularly since most companies have no interest whatsoever in the long-term value of biological resources. Secondly, it is in everybody's short-term interest (except that of forest dwellers, who have little or no say in the matter) to bring out as much timber as quickly as possible. **Even governments in the process of establishing strict quotas and rules, will turn a blind eye to environmentally destructive practices for the sake of short-term currency gains, and at the prospect of new land being released for landless farmers.**

In many cases, loggers are not foresters, but teams of hired labour. In other words, it is trading conditions, rather than evaluation of the long-term

monetary and non-monetary added value of forestry activities, which direct their activities. Only full enforcement of management systems (including input from local populations when possible, in order to add impetus to the enforcement), trade restrictions, and implementation of efficient rent capture systems, can ensure that logging activities follow proper forestry practices.

This report does not aim to provide an assessment of past and current relations between loggers (who are often Southeast Asian nationals), shippers and Japanese importers. It simply gives examples of the impact that the Japanese tropical timber trade has had on forestry practices.

It is notable that in the Philippines, logging concessions were given for one year only between the mid-1950s and 1966. The Philippines was the first country to be affected by the "logging boom", and 1966 was the date of the country's first serious attempt to improve prevailing logging practices. Forest destruction was already significant because US interests had mechanized log extraction and this had enabled intensive logging to be undertaken in the 1920s. After the Second World War, army engineering equipment was used to open forests and extract timber (Japan South Seas Timber Federation, 1976).

The considerable increase in exports to Japan in the early 1960s was facilitated by the "cosy" relationship between the Japanese trading houses, which bought the logs and provided heavy modern hauling and logging equipment (paid for in logs), the shippers (mostly Chinese firms who organized logging gangs); and the concession holders (mostly Philippine business families with political connections). One commentator notes:

As the timber boom gained momentum, the government was unable to supervise concessions effectively or enforce logging regulations. Links between timber companies and politicians further eroded government control (Repetto, 1988).

During this boom, large companies from importing nations were also involved in forest exploitation. Japanese direct involvement gained prominence not so much in the Philippines, but rather in Indonesia in 1966 when the new Suharto government started to "open" the country to international trade and foreign investment.

In Indonesia, the logging boom was effectuated by a combination of small, local logging teams; larger logging concerns dominated and organized by general trade interests; and a number of foreign companies. Japan was involved right from the beginning of the boom. The history of the development of Kalimantan's timber resources in the 1960s and 1970s is highly revealing of the ways in which the boom was engineered from the consumer country (see Chapter 4). As previously emphasized, the situation is now very different in Indonesia.

Changes occurred in the middle of the 1970s. In the wake of Indonesia's oil boom, the Indonesian

government adopted a policy of industrial development and domestically-controlled exploitation and processing of natural resources. In relation to timber, this resulted in new rules concerning the allocation of logging concessions, participation of local capital in joint-ventures with foreign interests, and the imposition of limits on unprocessed log exports.

In fact, the acceleration of these trends, coupled with the government's unwillingness to get involved in long-term agreements, led to some important multinationals, such as Weyerhaeuser, pulling out of Indonesia altogether. Log exports were later banned completely, and only processed timber exports permitted, with quotas for each demand market. This decision, together with the considerable investments which were then made in processing plants, completely changed the tropical timber trade. It was announced recently that sawnwood exports would also be banned as from 1989. The 521 concessions (291 in Kalimantan, and most of the others in Sumatra, with an average size of just over 100,000ha) are now controlled by nationals.

In Sabah and Sarawak on the other hand, the trade continued on a more traditional basis, despite these upheavals. The only major change occurred in Sabah, where a public body, the Sabah Foundation, holds 50% of the total concession area (1 million ha), and another company (Sabah Forest Industries) 15%. The remaining area is divided into smaller concessions. In the early 1980s, short-term licences were also granted. A great deal of pure forest mining due to political patronage resulted from this. These licences are no longer so common. In Sarawak, concessions cover nearly 4.9 million ha, or more than half the total forested area.

In Papua New Guinea, which in some ways may be considered the "last frontier" for unprocessed log exporters, there were around 45 concessions (covering 4% of the forest area) in 1987. These were held mostly by exporters – either nationals, or foreign companies. The 1.44 million m³ logs exported by Papua New Guinea in 1987 were produced and exported by just 39 companies.

3.1.3 The "Sogo Shosha" or Trading Houses: A Unique Japanese System

Most of the logs, sawn timber and panels are imported into Japan by the general trading houses, or sogo shosha. These all-in-one trading companies, which also have financial and holding functions, are unique to Japan. There are 8,500 sogo shosha in Japan, but a considerable proportion of their activities is carried out by the so-called "top nine" general trading houses. The smaller trading houses often specialize in a limited number of trade areas. For instance, there were around 1,000 smaller trading houses importing, exporting and distributing food products in the early 1980s, and 500 dealing in logs and lumber (JETRO, 1983). But the 15 largest trading houses handle the majority of tropical log imports.

Box Seven: Trading Houses and Industrial Groups

The general trading houses, or *sogo shosha*, are companies which trade and distribute on domestic and import-export markets, as well as between third countries. For instance, during the mid-1970s, *sogo shosha* were marketing Indonesian timber in Western Europe (Young, 1974). They are also financial intermediaries and borrow considerable amounts from banks. They lend to firms from which they buy, and to distributors to which they sell. They therefore participate in the control of the whole trade chain, from the extraction of raw materials, to domestic distribution in Japan. They also provide an invaluable service for their customers by absorbing currency exchange variations. This means that they have to hedge against fluctuations in currency markets. They also facilitate the transfer of information on international trade.

They are unique to Japan simply because Japan did not become involved in international trade until 1868, during the Meiji era. As two commentators have explained, new institutions were needed at this time:

The need for specialized trading companies grew out of Japanese ignorance of foreign markets and foreign languages, and the country's desire to become a participant in the world economy (Krause and Sekiguchi, 1976).

Born out of traditional family-owned domestic trading houses (such as Mitsui) and in close liaison with the government administration, the *sogo shosha* diversified into industrial activities. They often formed the basis of large industrial, banking and trading conglomerates, (the "zaibatsu").

The zaibatsu and *sogo shosha* were closely linked with the organization of the war economy, and so were dismantled in 1947. Moreover, the "Japan Securities and Exchange Law" strictly separated banking and stock operations.

The Modern Industrial Groups

However, groups soon re-organized, especially during the Korean war. Large groups have formed and these have had a considerable impact on the whole Japanese economy and its international trade relations. There are now six large groups which occupy the "centre stage". Three of them (Mitsui, Sumitomo and Mitsubishi) partly originated from the old zaibatsu/*sogo shosha* of the same names, and three others centre around large banks (groups of the Dai-ichi Kangyo Bank, Sanwa Bank, and Fuji Bank). Other important groupings are those of the Tokai Bank and the Industrial Bank of Japan.

These big groups are not organized on a formal share participation basis in the manner of North American and European holdings. Instead, there are several levels of company participation (from core companies, to major subsidiaries, to independent "affiliated" firms), with various links between members. These include the cross participation of board directors and interlocking minority shareholdings, use of the same bankers or trading houses, director membership of the same clubs (for instance, the directors of the 40 or so top ranked firms in Mitsui, such as Toshiba and Mitsui Mining, are members of the Monday Club (Getsuyo Kai) and the Second Thursday Club (Nimoku Kai)). Additionally, corporate and group strategies and decisions are communicated down to the 2,000 or so second and third rank companies of the group.

Generally several group companies hold shares in each other. The group as a whole can control anything between 20 and 40% of main members.

Inter-group links are also very common, particularly among groups centred on banks. For instance, the group of the Dai-ichi Kangyo Bank (DKB) has two main *sogo shosha*, C Itoh and Kanematsu Goshu, which compete with one another. But the Nissho-Iwai trading house, which "belongs" to the Sanwa Bank group, is also affiliated to the DKB group. It is also possible to find links between Nissan and Toyota, two of the main competing car manufacturers, through their associations with large- and medium-sized industrial groups.

The Trading Houses

In 1986, the sales of the nine largest *sogo shosha* (Mitsubishi, Mitsui, Sumitomo, C Itoh, Marubeni, Nissho-Iwai, Tomen, Nichimen and Kanematsu-Goshu) were as follows: 45% in domestic trade, 17% in third country trade, 20% through exports and 18% through imports. These same general trading houses accounted for 84% of total Japanese exports in 1986 (against 62% in 1970), and 40% of total Japanese imports (against 48% in 1970). Their total activities (total transaction volume or TTV) were equivalent to 30% of GNP throughout the early 1980s, but fell to just under 25% in 1986.

Despite the fact that these figures are ambiguous, on account of the double counting of the trade activities of joint ventures between trading houses, for instance in oil imports (Nomura, 1988), they do show that the general trading houses are still of considerable importance in the Japanese economy.

Companies within a group compete with one another, as do departments within trading houses, which are managed separately. The network of internal and external relations is

therefore complex. Trading houses are usually a part of a large group, and as such have minority stock investments in numerous companies, with which they solidify business ties. They also form an international market intelligence network. Their offices, subsidiaries and affiliated companies work all over the world, gathering information on commodities, products, markets, and socio-economic trends. They have the ability to gather and distribute information very quickly.

Sogo shosha also play an important role in restructuring industrial sectors. Typical examples include the textile, steel and oil industries. This is made possible by setting up a relationship between suppliers and processing industries at different stages in the distribution and production cycle, organizing financing and credit for the whole sector, helping capital restructuring, investing in strategic sections of industries and so on.

The importance of the sogo shosha in the tropical timber trade is seen in Figure 22. This gives the changing volumes and origins of the tropical log imports of the seven main importing companies. Most of these are sogo shosha. Figure 22 also shows the total tropical log imports of the top 15 companies and the percentage of imports controlled by the top six companies (as opposed to the top 15).

However, it is not this oligopoly of timber imports which makes the sogo shosha so important in the structure of the tropical timber trade, but rather that they involve themselves at all stages of the extraction, importing, processing and distribution of tropical timber products.

Subsidiaries, or companies closely affiliated to sogo shosha, directly participate in logging and processing in the producing countries of Southeast Asia and the Pacific (see Chapter 5). Just as importantly, the overseas offices provide financial facilities to loggers and shippers in these countries, allowing them to buy heavy equipment and start their activities.

Sogo shosha can also influence tropical timber markets through their international intelligence gathering network. A company such as Mitsui invests as much in communications as in research and development, and exchanges up to 80,000 telexes per day (Kojima and Osawa, 1984). Employees working in overseas offices and timber department headquarters in Japan are among the world's most knowledgeable people in relation to resource analysis, the current situation of commercial forestry and its medium-term trends.

Policy-making is extremely centralized. The role of the "honbucho", the timber department director, who is generally a board member, is crucial. Despite this, once headquarters have transmitted information back to overseas offices, they generally allow them great autonomy in terms of implementation.

Sogo shosha tend to focus their earning potential on TTVs and global profit yields, rather than on profitability ratios. They assess the results of their departments, overseas and regional divisions and local offices in a similar way. Regional divisions and product departments are deliberately set against one another in fierce competition at this level.

For the tropical timber trade, the consequence of this corporate strategy is that, rather than concentrating on long-term – or even short-term – returns of high value products, the sogo shosha are often prepared to use the "grab it and run" strategy.

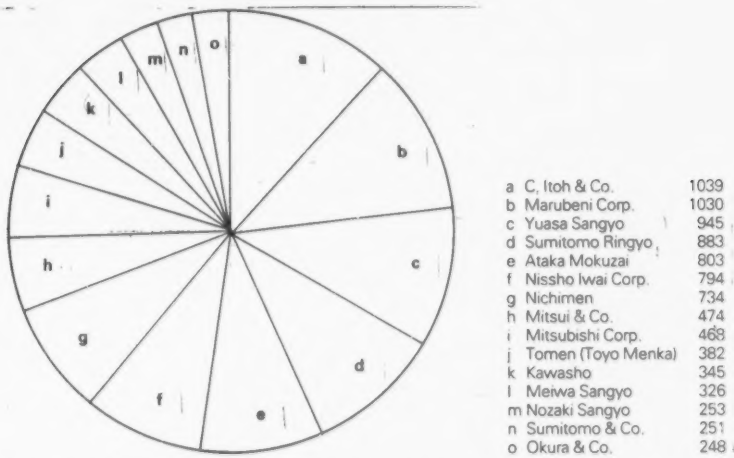
A view frequently expressed in Japan is that sogo shosha activities help to stabilize the price and supply fluctuations of commodity markets:

Since the prices of many of these products are extremely sensitive to fluctuations in supply and demand, the role of trading companies in providing a stable long-term supply and minimizing price fluctuations is a major one (JETRO, 1983).

In our view, this conclusion is flawed. Sogo shosha trade practices can be detrimental to the stabilization of markets. In the domestic Japanese market, the sogo shosha play an important role in smoothing down price variations, playing on stock levels and being prepared to lose money in the short term, in order to level out sudden price peaks. This happened most recently in 1985-86, when the majority of timber departments were trading at a loss (Asian Timber, 1986b). However, the sogo shosha themselves provoke speculative moves in international commodity markets, which they later have to smooth down in Japan. This potentially destabilizing role has been described as follows:

With respect to the import of raw materials, most products are standardized and prices are set in world markets, but Japanese purchases loom so large in world trade that the behaviour of the trading companies can have an effect on world prices. It has been noted that one trading firm tends to emulate another in follow-the-leader fashion. For example, if one company, thinking a product is in short supply, makes anticipatory purchases, the others will follow suit, causing an excess of quantity requirements, rapid escalation of prices, and market instability. Ultimately, the excess must be sold back into the market, causing a collapse of the price. In this way world market price instability can be exaggerated by the inventory policy of these ten Japanese firms (Krause and Sekiguchi, 1976) (The ten firms referred to are

Figure 22: The Main Importers of South Seas Logs in Japan in 1987
(All volumes in thousand m³)



Note: The main 15 traders import 64% of South Seas logs to Japan.

(b) Origin of South Seas Logs Imported by the Main Traders in 1981 and 1987

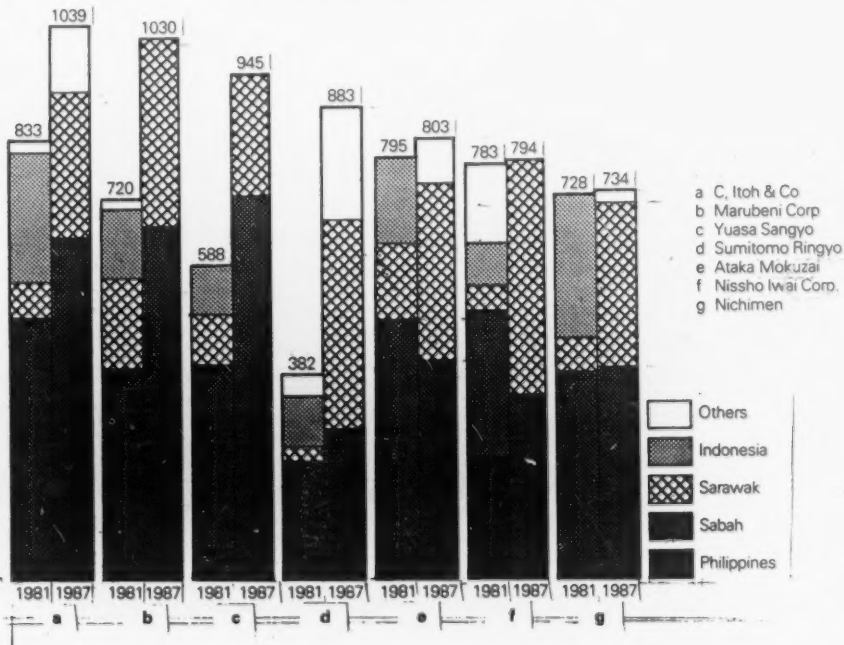
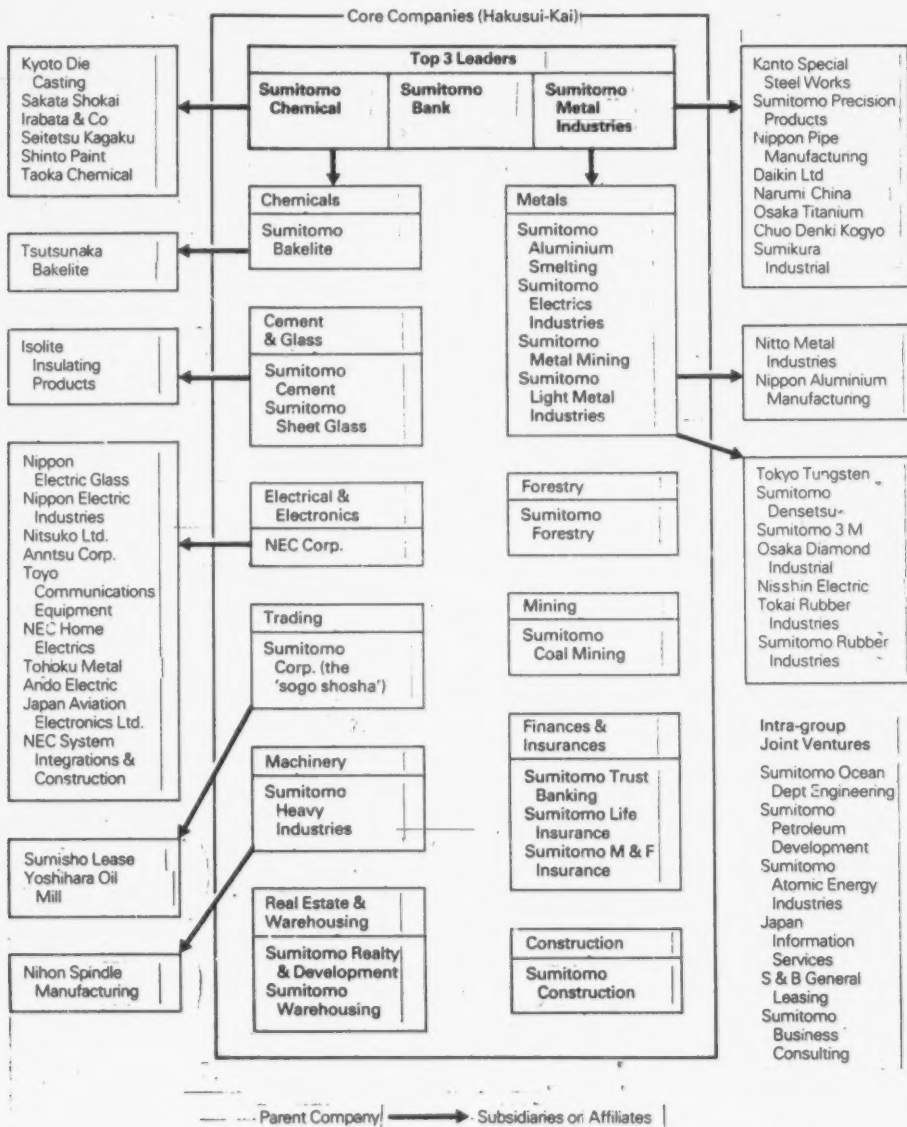


Figure 23: Structure of the Sumitomo Group



the nine main sogo shosha listed above, plus the tenth in size, Ataka Mokuzai, which is currently the third largest importer of tropical logs by volume.)

Although this description is now 12 years old, it has not changed, and the term "product" could be replaced by logs.

The sogo shosha are also involved in transport, since each large industry/trade group includes a transport company (see Section 4.2). These transport companies have pioneered specialized log carrier ships. Sogo shosha sell commodities directly to the processors (in this case, plywood and furniture manufacturers). They then redistribute a large part of the processed products wholesale.

Perhaps the best way of understanding the trade relations within a group is to look at a simplified organigram of an industrial/trading group. Figure 23 gives the simplified structure of Sumitomo. The second and third ranking firms of the group, as well as many of its affiliated firms, are not represented.

3.1.4 Are Trade Structures Changing?

1986 was a disastrous year for the sogo shosha. Most saw their turnovers reduced considerably. For instance, the sales of the Mitsubishi Corp dropped by 26% between 1985 and 1986, Mitsui's by 22%, and Sumitomo's by 9%. During 1987, most of them were unable to regain their 1985 levels, despite the upsurge in the value of the yen and the general increase in Japan's international trade.

Their difficulties in the early and mid-1980s mainly arose because they work mostly in "traditional" sectors, such as commodity imports, or heavy industry products such as steel, oil and textiles. These sectors have cut-throat markets, largely because they concentrate on the ordinary management system of TTV, rather than profit levels. Despite a relative specialization, the nine major sogo shosha compete very hard in the same markets, at home and abroad, and for the same type of products.

As a result, and because they mostly work in bulk, their profit margins are very low. This is especially true for the larger ones, for whom the gross margin on sales (ie before paying interest and receiving dividends from investments) varied between 1.6% (C Itoh) and 2.5% (Mitsubishi) in 1986 (Nomura, 1988). In 1986 also, net margins were as low as 0.2% (Sumitomo), and 0.4% (Mitsubishi). Even more significantly, the sogo shosha have become very dependent on volatile commodity markets. Yet most of the important international trade of industrialized countries and Newly Industrialized Nations (NIC) is in high technology processing tools, communications equipment, and high-tech consumer goods.

One of the leading financial trading companies in Tokyo, commenting on the sogo shosha, recently stated:

Their strengths ultimately became liabilities. Automakers and makers of precision instruments and electronics found that the traders did not possess the necessary technical capabilities for selling and servicing their products. They consequently set up their own domestic and international distribution systems in the 1960s. Not only did the traders find themselves frozen out of the high growth sectors of the economy, but they saw demand for their financing decline as manufacturers became able to self-finance their businesses. Many of the heavy or material industries are shifting production to outside Japan. The result is that the traditional business of the trading firms is shrinking (Nomura, 1988).

However, the general trading houses are making considerable efforts to change this state of affairs. Most of them have created subsidiary trading houses which specialize in new technology products or consumer goods, in order to keep up with developments. This has been particularly marked in the telecommunications sector, ever since deregulation (in Japan). They have also directly invested in joint ventures in advanced technology, such as biotechnology, advanced electronics, and new materials. In 1988 the sogo shosha recovered their profits, partly due to their reorganization, but mostly because of the accelerating economic boom in Japan (Financial Times, 1988).

Are these new trends affecting the timber trade in any significant way? On the face of it, no. The general trading houses still control most tropical timber imports, and a large chunk of the manufacture, financing and distribution of plywood. However, at a deeper level it can be said that even in this sector, the general trading houses are having to change their tactics.

For one thing, they can no longer perform their global roles in a number of important countries, such as Indonesia or the Philippines. It is symptomatic that some of the general trading houses started importing plywood from Indonesia themselves, after trade rumours that Japan plans to retaliate against the log export ban, for instance by switching to North American sources of raw material.

Additionally, countries such as Indonesia have quickly learnt – particularly as a result of their European experience – how to market their plywood themselves. They no longer need to borrow the expertise of foreign trading companies, as they did during the 1960s. Also, APKINDO's organization of plywood marketing has been relatively successful in the United States and Europe. Its recent move to create a trading company in Japan for the marketing of kon-pane illustrates a new boldness.

To conclude, it looks as if the *sogo shosha* still have a dominant role to play in the tropical timber trade. But it seems unlikely that they will be able to control the importing process from source, for much longer. Tropical countries (Indonesia or Malaysian states) and temperate countries (especially the US) are now willing to venture directly into the Japanese market.

3.2 Timber as a Commodity: Costs and Pricing Structures

In Part One, some of the differences between imported timber prices and those of Japanese domestic timber, were described. The short-term uncertainties and speculative character of the tropical timber market has also been emphasized. The price formation mechanism of tropical timber reflects the evolution of short-term costs and demand variations on the international market, but does not take into account the long-term marginal costs of forest regeneration.

3.2.1 From the Forest to the Harbour: Logging Costs, Rent Extraction and the Question of Illegal Felling

The concession system used by governments in most of the tropical world for controlling the exploitation of timber in closed forests, is set up not only for the management of commercial forests, but also to allow public authorities to collect revenue. If timber is exported, duties and conditions are generally applied. Rules relating to concession licences, and royalty and taxation systems, differ from country to country. In Southeast Asia they have been influenced by colonial legal systems, socio-political history, and the ways in which forestry has developed during the last two or three decades.

Most concessions have a duration of between 5 and 25 years. There are also short-term timber permits in some countries. **Logging companies extract timber from forests which they have not planted and which they will neither regenerate nor tend.** Their costs are therefore limited to logging, extraction and marketing. Consequently, throughout the duration of a normal felling licence, the logging companies and trade intermediaries receive a profit which is often far higher than the "normal" remuneration of capital, once labour and equipment costs have been accounted for. This is the rent, often defined as the "surplus" profit available to the firm extracting or producing a good for which the supply is inelastic. Many natural resources which are non-renewable by definition or because, like tropical timber, nobody attempts to renew them, are in this category.

As forests are mostly state controlled, public authorities have to take the responsibility for collecting this rent. It is added to the funding which is allocated to the regeneration of commercial forests and settling of any social costs arising from the depletion of natural resources.

There are now definite grounds for believing that Southeast Asian countries applied particularly inefficient policies at this level throughout the 1960s and 1970s. They captured only a small fraction of the total rent gained by the logging and timber trade, and, to make matters worse, captured it through systems which favoured destructive and wasteful timber exploitation.

These inefficient policies, coupled with very lax licensing systems and weak implementation of forestry regulations, helped to fuel the so-called "timber booms" of the 1960s and 1970s. It was not until the 1980s that some countries managed to set up more efficient rent capture systems and apply stricter logging regulations. These helped to limit the disastrous economic and environmental impact of the systems providing the exports upon which Japan had relied so much.

The Philippines provides a typical example. The country's current government now openly recognizes that forests were plundered. During the 1960s and 1970s, two systems co-existed which facilitated exports to Japan. The first was based on local concerns (Chinese timber merchants), who generally organized and carried out the logging. They did not hold the concession however. This was retained by "politically well-connected" Filipinos. Japanese trading houses would loan the large capital necessary for the purchase of logging equipment. The repayments of such loans were made in log shipments. The trading houses themselves would sell Japanese equipment.

The second system consisted of joint ventures between local capital and Japanese trading houses:

... the Philippine side was usually required to hold a majority share in the company, but in most cases could not put up a sufficient amount. With concessions in the vicinity of 50,000-60,000 hectares, capital investments of a million dollars at the very least were required ... In cases where the Philippine side could not supply enough capital to make up 60%, the Japanese side would provide the difference through the back door ... These back-door funds often accounting for as much as 30% of the total, could not be insured. As a result the Japanese side endeavoured to recover the uninsured amount as quickly as possible, contributing to the extremely rapid exploitation of concession areas (Suzuki, 1986).

Other factors contributed to the accelerated logging out of whole areas. During the 1970s, concessions were granted for the relatively short period of 1-10 years. Logging quotas were therefore flouted on a near permanent basis, and there was obviously no incentive to practise careful logging, let alone stand regeneration.

For a long time the government's main revenue source was a volume-based charge. This remained at low levels and was not adjusted for inflation for

a very long time (In 1983 it was still 20 pesos per m³). However, it still proved too much for the companies involved. Illegal felling – corruption was rife in the Bureau of Forestry Development – provided a means of improving returns on the investment.

It has been estimated that between 1970 and 1982 total taxes from the Philippine forestry sector represented only 14.8% of the total "reported" export value of timber products (logs, sawnwood, veneers and plywood). This obviously does not take into account the considerable "value" of illegal, unreported commercial felling and smuggling practices (see next section). As one commentator politely puts it:

These tremendous incentives explain the industry's rapid expansion, surreptitious log exports, and evasion of logging restrictions (Repetto, 1988).

When the new regime came into power in 1986, several events demonstrated that the previously denied allegations were true. Various large concessions, some of them directly connected with Japanese interests (see Chapter 4), were cancelled. At the same time, a number of people, including officials, were charged with corruption. But the Minister for Natural Resources declared, "I have the feeling that it is just the tip of an iceberg" (Asian Timber, 1986). The ministry later closed 43 illegal sawmills (Timber Trade Journal, 1987).

It is surprising that this situation survived for so long and with so few questions asked. Endless forestry development plans which were only remotely related to the reality on the ground, were drafted, accepted and funded, and with the support of international organizations. One can only speculate that nobody on the international scene was disturbed by this destructive situation. As early as the 1950s, the Japanese trading houses had been indirectly offered a profitable resource base in the Philippines. The Japanese sold extracted timber to plywood manufacturers, and also exported it to the US in order to obtain scarce currencies. This triangular system, highly detrimental to the natural environment in the long term, also permitted the excesses of the local Marcos "cronies", now denounced by everybody.

In those other countries which at one time or another supplied the bulk of Japan's log imports, the story was quite different. In Indonesia, the commercial development of the vast forests of Kalimantan was made a great deal easier by the lax terms for foreign investments during the late 1960s and early 1970s. US, Japanese, Far Eastern and Filipino interests flocked into Indonesia, and although wood exploitation had never been a priority investment, it became an important sector.

However, export conditions changed fairly soon after the heydays of the early 1970s. This was largely due to the fact that in Indonesia, after the oil crisis, there was widespread recognition that domestic profits arising from timber exploitation should be higher, and that domestic processing of timber was not progressing as fast as originally hoped. Indeed, since the mid-1960s, tremendous tax advantages had been given to loggers, especially in relation to exports, to compensate for the development of domestic processing. This has been described as follows:

Firms were granted five and six years' tax holidays from the initiation of logging activities, and reaped very large benefits thereby. By the end of the tax holiday periods, almost no processing activity other than token sawmilling was in place (Gillis, 1980).

Lack of response on the part of logging interests, compounded by general changes in natural resource trading in developing countries following the oil crisis, led the Indonesian authorities to introduce new policies in relation to forestry industries. In 1980, concession licence holders were allowed to export only 20% of their extracted timber as logs. The remainder had to be processed domestically, as from 1981. It was further announced to a startled trade that from 1985 all log exports would be banned (Gillis, 1984). The trade, and in particular the Japanese took the view that the measure would not be fully applied. However they made a number of investments if only to take advantage of what they supposed would be transitory measures.

The full ban was effectively implemented in 1986. This came as quite a shock to the international timber trade who believed right up until the last minute that the Indonesian authorities would not dare to do such a thing. (After all, in 1975, President Marcos had ordered a similar ban, which, due to pressure from powerful logging interests, had been considerably weakened even before being applied, and never properly implemented).

The ban had significant economic consequences. Some estimates put losses in logging jobs at 30,000 (Gillis, 1984), and some important Far East plywood manufacturers went bankrupt (for instance in South Korea). But considerable investments were made in plywood manufacturing capacity. In 1977 the number of plants was only 16. (This was the year before the first measures for increasing domestic processing were decided upon, including the doubling of the log export tax.) But by 1983 this figure had risen to 182 (P T Data Consult, 1983).

Indonesia and the Philippines are not the only countries which provide examples of the relationship between forestry policies and timber exports. Other Southeast Asian countries have adopted other systems. For example in Sabah, because of the very high *ad valorem* royalties on

logs, and the short-term concession logging licences (mostly under 5 years), there has been a tendency to practise wasteful and extensive "high-grading" logging (In other words, taking only the best logs from a stand, which entails destroying up to 62% of the remaining trees (Repetto, 1988).)

The whole question of rent extraction, through increased royalties, taxes and duties, is very complex. It not only involves extracting a "fair" rent from the traders and exporters, but also organizing fiscal and duty pressures in such a way that they favour the adoption of the least destructive logging methods.

Public income from commercial forestry is generally collected through several channels but principally via: royalties and levies on extracted products; licence fees and other forest charges; taxes on company profits and export duties. Royalties on products extracted from the forest and export taxes can be calculated in various ways: *ad valorem*, on a product/species scale, on a volume basis (flat rate), or on any variation of these. Comparisons between systems are difficult, since taxation and duty systems are established on different bases. However, a recent study prepared by the World Resources Institute (Repetto, 1988) on this subject concluded that:

Forestry policies, the terms on which potential users can exploit public forests, include harvesting fees, royalties, logging regulations, and administration of timber concessions with private loggers. Governments have typically sold off timber too cheaply, sacrificing public revenues and the under-valued non-timber benefits of the standing forests while encouraging "timber booms", profiteering, and rapid logging exploitation. Also, the terms of many timber concession agreements and revenue systems have encouraged excessive "high-grading" of the forests and wasteful, resource-depleting logging (Repetto, 1988).

Why did Japanese traders agree to buy logs at such a price when they knew that considerable surplus profits were being made? The basic reason is that this profit does not make its way into one pocket only, but is distributed through a chain of "overheads", "service fees", "commissions", and so on, which soon inflate selling prices to levels above logging and storage/transport costs. In any case, the trading houses know very well that this socio-institutional system makes logging so lucrative that the whole process runs smoothly. Indeed, in relation to demand in Japan, security of supply is considered to be so important, and the price advantage in comparison with domestic timber is still so high, that surplus profits are not a major concern.

For example, in the early 1980s, extraction costs in Papua New Guinea were estimated to be around US\$37/m³ for the average logging concession (JICA, 1980). This included consumable costs (9.1), repairs to machines (2.1) and administrative costs (7.9), including transport and yarding, depreciation, administration and overheads. On average, costs in natural Dipterocarpaceae forests in Southeast Asia ranged from US\$30–60/m³ in the early 1980s (most of them were between US\$35–45/m³). In 1982, the export price, fee on board (FOB, ie excluding freight or insurance costs – see Glossary) for logs was around US\$65/m³ on average, with considerable variations between species, grades, etc.

However, if the profits of commercial logging and exporting can be considerable, it is also true that the international markets have been highly unstable since the early 1970s. After boom periods during which many loggers opened new logging fronts and invested in heavy equipment, sudden falls in international markets have often occurred, putting numerous firms out of business, or at the very least forcing them to work at a loss.

This was the case in Sabah, in the early 1980s, when two series of events happened at once. The impact of the world crisis was particularly strong in Japan, depressing prices and heavily reducing the demand for Sabah's logs. At the same time, the Sabah government decided to increase royalties enormously, in order to make timber exports its main source of revenue. The timber trade therefore found itself in some trouble, and protested loudly to the authorities. After a year, in 1979, when Sabah log export prices had almost doubled, and export volumes increased by more than 50%, the government decided to increase the level of royalties to 60.8% of the FOB export price of logs. According to the Financial Times, the export FOB price of logs was on average around US\$110/m³, with taxes leaving only US\$45/m³. Yet logging and transport costs were themselves around US\$45–50/m³ (Financial Times, June 1980). Two years later, the crisis became even more acute. Another article in the Financial Times stated that:

Timber is critically important for Sabah. It accounted for over 40% of the state's export earnings in 1981, and over 60% of state revenue. Until recently timber licences were used as the primary form of political patronage, and were the passport to wealth for the lucky few.

Today, prospects look rather different. Unsawn timber, 70% of which goes to Japan, has fallen in price to US\$105 per m³, less than half that of a year ago. A state government royalty of about 50% means that most loggers in the state's interior are operating at a loss – and that timber exporters from the US and the Soviet Union can deeply undercut Sabah's prices (Financial Times, 1982).

However, it would be misleading to think that, because of high taxes and depressed prices, the

logging of Sabah's forests slowed down. Despite official government policies aimed at reducing exports of unprocessed logs, these actually increased. The reason for this is simple. Once logging has started, the loggers (who have borrowed heavily), trading houses (who have engaged funds) and the authorities (who are starting to receive taxes and royalties), cannot curtail their operations because they have so much at stake.

The structure of these costs, within the socio-economic context of many tropical countries, largely explains why illegal felling occurs. Most of the costs are front-ended, and the level of profit (or loss) is determined in the aftermath of the operation, and depends on volatile prices. **Illegal felling is carried out either by small clandestine operations, which taken together can represent significant volumes (and which do not require the heavy front-end expenditure of large ventures); or by large operations, which are partly financed (in the case of logging for exports to Japan) by the trading houses.** Large cash returns must be made as quickly as possible, in order to reimburse the front-end capital expenditure.

3.2.2 From One Harbour to Another: Export Duties, Transport Costs, Illegal Exports and Transfer Pricing

Once the local office or correspondent of the Japanese importer has checked the timber – generally in the harbour, yard or ponds – it is loaded onto ships, which will either go directly back to Japan, or call on other timber loading points so that their cargo capacity is full.

For a long time, the lack of proper loading facilities in many islands of Southeast Asia hindered exports. However, this changed in the 1970s. Considerable investments were made, and more and more specialized vessels built and put on a continuous rotation system between Southeast Asia and Japan. There are currently nine timber loading harbours in Sarawak. Three of them (Miri, Tanjung Mani and Bintulu) handled 92.5% of log loads in 1987. In Sabah, 43% of exported logs were loaded out of one harbour, Sandakan. Of the seven other harbours of importance, three (Tawau, Kota Kinabalu and Lahad Datu) handled a further 50% of all log loadings in 1987.

Most timber-carrying vessels have a capacity of around 6,000 tonnes. These vessels are owned by sister companies which either belong to the same groups as the sogo shosha, or are affiliated to them in some way. (For instance Mitsubishi Corp will use NYK ships.)

The cost of timber shipping has been relatively low since 1986. Lower fuel prices have meant lower fees. Furthermore, after the import frenzy of the mid-1970s, a tendency to ship over-capacity has developed. Japanese demand for tropical timber shrank in the early 1980s and as a result fewer cargo ships were required. Intense competition between shipping lines, leading to a lowering of fees, resulted. Early in 1987, these were around US\$20 per metric tonne (around US\$15/m³) for shipments from Sabah to Japan, and slightly less for shipments from Sarawak. Previous to this they had not moved significantly since the spring of 1986, when the fall in oil prices allowed them to be reduced from US\$20 in the summer of 1985 to US\$16 per m³ in March 1986.

In the case of average quality logs sold to plywood manufacturers, these shipment fees, plus the trading company margins and costs (including insurance), add another 20–25% to the export FOB price. As usual, the trading company margin is quite low.

The explanations given above assume that all the normal trading procedures are scrupulously respected, and that no "under the counter" operation intervenes. In fact, it is well known that the timber trade in Southeast Asia has been plagued by corruption, illegal exports and duty evasion.

Illegal Exports and Duty Evasion: the Philippines

In 1986, the Filipino press began to write in great detail about the illegal dealings – involving corrupt officials, illegal logging, under-reporting of exports, and false export permits – which had been taking place in the timber industry for decades. These facts had been known long before, but few international institutions or foreign bodies had dared to officially criticize the Marcos regime.

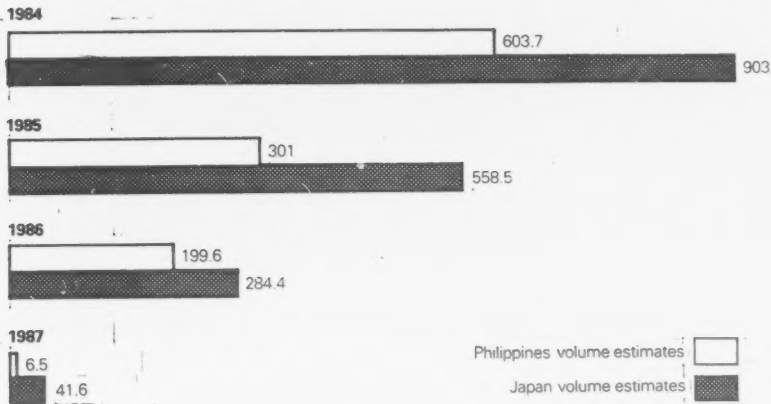
According to estimates made by the new administration, actual imports by Japan, Taiwan and South Korea

... totalled 8,163,000 m³ during the period, as against logging companies' export claims of only 4,397,000 m³. There is a discrepancy of 3,766,000 m³. Maceda (the new Natural Resources Minister) noted, or over 750,000 m³ yearly valued at US\$120.48 million in total or at US\$160/m³.

Almost 940,000 m³ of logs were unloaded in 1984 to Japan alone, or double the 599,082 export quotas of the industry, the minister said citing "outright smuggling" of almost 350,000 m³ worth one billion Pesos (Malaya, 1986).

Figure 24: Philippines Log Exports to Japan 1984-1987: the Difference Between Trade Statistics
(All figures in thousand m³)

Difference between Japanese and Philippines estimates



The first part of Figure 24 is based on detailed trade statistics from the Philippines and Japanese customs administrations for the years 1984 to 1987. It shows that the practice of under-reporting export volumes, permitting tax evasion and illegal over-logging, only appears to have ceased in 1987, when the new ruling power was able to exert full authority and fight corruption in the administration.

In 1984, 903,000m³ of logs from the Philippines were imported into Japan, but only 603,700m³ were recorded as leaving the country. Even if significant non-compensating accounting errors were made on both sides, the 33% gap between the two sources would remain unaccounted for. The figure given by the minister in the *Malaya* article (quoted above) is probably a reasonable guess as to the volume of smuggling during this particular year. In 1985, the discrepancy was still considerable: 257,000m³, or 46% of imports into Japan, went unrecorded. In 1986, 85,000m³ escaped recording in the Philippines, probably because the new government authority was not yet in place.

Even in 1987, when log exports were already strictly banned in the Philippines, and only a few tail-end shipments authorized, 35,100m³ of "unexplained" logs left the Philippines for import into Japan.

It is regrettable that the Japanese authorities do not publish detailed figures on arrivals at harbours by country of origin, as this would facilitate understanding of why such discrepancies still persist. In the present circumstances, one can only infer that illegal exports from the Philippines still continue, although on a far smaller scale than previously, and that the Japanese authorities close their eyes to this traffic, much as they have done for the last 30 years.

Box Eight: Making an Illegal Profit

The system used for processing illicit profits involved several groups of people. The logging company, which had a concession licence stipulating the maximum cut per month, would actually fell a larger volume. This was in order to speed up the return on the initial capital investment, dodge company taxes and timber royalties, and take advantage of economies of scale in shipping. In some areas, illegal felling was carried out on a grand scale, with private armies "protecting" the operation. A "gratuity" was given to some customs officials, who would stamp an official document which would be shown to the Japanese officials when the ship arrived in the Japanese port. It indicated the true volume of the shipment. The document was valid, it corresponded to the shipment, and nobody asked questions.

Back in the Philippines, another set of documents was prepared, indicating the false, under-evaluated log volume (corresponding to the licence felling allowance). Letters of credit were then exchanged between Hong Kong (where a front company was used by the importer and exporter to help the transfer of illicit profits) and the Philippines, and between Hong Kong and Japan. The Philippine logging company received the payment for the under-valued volume of logs from Hong Kong, but the Hong Kong company received the full payment corresponding to the real shipment from the Japanese company.

The difference was split between all the participants, but often stayed in Hong Kong as it was not taxable and could be used to finance other international operations. The system was well-known, but until recently, no hard facts were available to document it. The Philippine authorities under Marcos were themselves corrupt, and any kind of challenge, for instance, from international organizations, would have been pointless. However, since 1986 a number of corruption cases involving officials of the Bureau of Office Development, who provided fake felling permits, have been brought to justice (Asian Timber, 1986).

More recent events in Papua New Guinea have also aided an understanding of the practice of transfer pricing through Hong Kong, with dummy companies channelling illicit profits.

Transfer Pricing and Other Illegal Practices

There are several examples of the illegal practices of timber exporting companies in Southeast Asia, for instance, in Indonesia in the early 1970s, and more recently, in Papua New Guinea. A case in Indonesia came to light because it caused a major dispute between a number of foreign-dominated logging ventures on one side, and government authorities on the other.

Official perceptions were that large investments, particularly foreign investments, in the timber sector had not created the expected number of jobs for Indonesians. Disenchantment with employment growth in timber led in 1974 to the enactment of special taxes on foreign timber workers and other measures to promote greater employment of nationals.

Still another source of official discontent was the discovery, in 1973, of a substantial under-valuation of exports by several national and foreign firms. In some shipments to the Japanese market, firms were said to have understated FOB values by as much as 40%, thereby lowering their liabilities for export taxes and, ultimately, income taxes. In response, the government enforced an older "posted price" system for log exports and, for some tree species, raised posted prices by 50% or more in 1973 (Gillis, 1987).

In Indonesia, there are strong indications that illegal exports continue, in several forms. For instance, where Indonesian rules state that ramin cannot be exported as logs or sawn timber, but only as semi-finished or processed timber, a simple ruse can be (legally) applied. Boards are cut oversize, planed on four sides, and minutely moulded on one edge. This is enough to classify the boards as semi-finished. As they are slightly oversized, the boards can still be used as raw boards when they reach their destination.

According to trade sources, a large quantity of Indonesian white meranti logs (from Kalimantan) is also exported through Sabah illegally, and feeds Japanese and European markets.

In the case of Papua New Guinea, several changes in forestry policy have been implemented since the early 1980s. In particular, the government decided in 1979 to move towards a more export-oriented forestry policy, centring on log exports. The 1979 Forestry White Paper (re-issued in 1988) stated that

The Investment Guidelines (in previous section of the White Paper) indicate a substantial departure from the existing and very firm restrictions on the export of logs from Papua New Guinea in policy if not in practice. It will be firm policy to allow the increased export of logs. (Ministry for Forests, 1988)

Papua New Guinea rapidly became a major log exporter to Japan in the mid-1980s, when a number of foreign logging and pulp ventures were established. The aforementioned policy was even reinforced by the 1985 government. Simon Hirata, managing director of Stettin Bay Lumber Co (the subsidiary of Nissho Iwai, a very large Japanese company) declared in 1987 that:

Unlike other Southeast Asian countries, the government forest policy in Papua New Guinea provides for a relaxation of the restriction on log exports. The government, which was formed in November 1985, is attempting to boost the industry so that it can attract more revenue and one of the practical ways to boost it is to increase log exports (World Wood, 1987).

But despite growing exports, this policy did not boost government revenues, employment or economic development as hoped. In 1987, a commission of enquiry was constituted in order to examine the situation in the timber industry. At the same time, numerous documented articles started to appear in the press, denouncing the situation in unequivocal terms. In May 1987, an article in *The Times*, a Papua New Guinean paper, was entitled: "Our Logs are Virtual Giveaways - Thieves and Scoundrels Must be Removed" (Grynberg, 1987). It soon became apparent that many logging companies had used every trick in the book to avoid paying any tax or royalties. These were in fact already very low by international standards, and even lower than those in Sarawak.

The problem was not so much under-reporting (as in the Philippines), as under-pricing and third country invoicing; in other words, transfer pricing. This was often accompanied by a false declaration of species and grades. (Forestry department officials rarely check ship loading, due to lack of resources and staff.) The analysis of official trade statistics in Japan and in Papua New Guinea (see Figure 24b) is difficult to interpret. Log export volumes recorded in Papua New Guinea tally closely with those recorded in Japan. There was a difference of 5% in 1985 and 1986 (which is within the boundaries of statistical recording error), and 8.6% in 1987.

But the transfer pricing operations have been better documented. A journalist described the system as follows:

The modus operandi of transfer pricing is quite simple. The exporter establishes a conveyancing conduct through Hong Kong. This can be a company owned by the exporters or an agent acting on his behalf ... The buyer opens a letter of credit for the full agreed price of the shipment to the Hong Kong agency. That entity in turn opens a letter of credit to the PNG exporter for whatever average price per cubic metre the shipper feels he can declare within the constraints of the minimum export price (MEP) list. The price differential between the

two letters of credit remains on deposit in Hong Kong at the disposal of the exporter.

In the case of foreign-owned subsidiaries this price spread may be dropped off in Hong Kong via back-to-back letters of credit or taken directly to Japan and booked as part of the corporate profits of the parent company (Solomon, 1987).

At about the same time, the United Nations' Centre on Transnational Corporations published a report showing that the widespread transfer pricing practice in Papua New Guinea's timber industry was one of the factors which made the country's forestry revenues so small. The Commission of Enquiry referred to above, which has not yet published its final recommendations, nevertheless released an interim report, which, in the words of a well-known trade journal:

states that transfer pricing had been far more widespread and far more serious than previously suspected. This involved a number of companies, and resulted in extensive tax evasion and the cheating of landowners and government of substantial revenue legally due.

The report also reveals that there have been many transactions concerning log shipments where companies deliberately engaged in large-scale deception aimed at defeating government policy in the timber industry. The deception involved a variety of devices, including understating income, overstating costs, mis-describing species and grades of logs and quantity/volume of logs shipped, and the manipulation of shipping and other costs.

The Commission of Enquiry research showed that stated prices for PNG logs were 10-20% below the actual price paid by a foreign buyer ... It was revealed that most of this "extra" money was paid to "middlemen" companies in Hong Kong, Singapore and Japan. The companies are closely related to the companies selling the logs in PNG (Asian Timber, 1988).

There is evidence that major Japanese companies have been involved in transfer pricing in Papua New Guinea. For instance, Shin Asahigawa (which holds logging rights in Papua New Guinea) is said to have sold 1707.06m³ for US\$437,715 to Sam On, of Hong Kong. But the invoices in Papua New Guinea showed that 1943.35m³ had been sold for US\$387,675. Gaisho, another Japanese company, is said to have sold 1684.259m³ of logs to its parent company in Japan for US\$289,692, whereas invoices in Papua New Guinea indicate that a payment of US\$259,375 had been made for 1684.259m³ of logs (Weekend News, 1987). Sango Nagoya is yet another Japanese timber company whose involvement in transfer pricing has been publicized. It received supplies from a logging company called Angus (Papua New Guinea) located in the Gadaisu concession area (*The Times*, 1988).

3.2.3 Entering Japan: Duties and Costs

We have seen that sogo shosha tend, as trade intermediaries, to prefer to maintain the maximum volume of trade, so that they can maximize their profit yields, rather than their profit ratios. Indeed, the sogo shosha profit margin in Japan itself is not very high.

But there is another cost which affects the competitiveness of imported semi-processed and processed timber products, namely customs duties. As in any industrialized country which requires unprocessed commodities for its industries, Japan tends to grant these commodities duty-free access to the domestic market, and to set up all sorts of barriers – tariff based or non-tariff based – for products made of the same commodities but manufactured in the country of origin. This applies particularly to timber products. Log imports have been duty-free since 1961 (when Japan started to organize a major import policy). It is slightly misleading to claim, as one Japanese government institution has done, that:

Japan's wood imports have been completely liberalized (Japan Housing and Wood Technology Center, 1988).

Or, as the same document declared, that:

Japan's tariff on wood and wood products is the lowest.

The illustrative table used in this document appears to support this argument: tariffs for log imports are 0% in Japan, just as they are in the US and the EC. But tariffs for products such as finished lumber, mouldings, veneers, plywood and fibrewood, which are significantly higher in Japan, do not appear. The tariff presented for lumber (0.2%, as against 0.4% for the US and 0.8% for the EC) is misleading. Tropical hardwood sawnwood is duty-free in the US and EC, but not in Japan.

Japanese protectionism is a sensitive subject, politically highly charged. The continuous trade war between the US and Japan, especially that relating to timber products, demonstrates this. A kind of triangular game between the US, Japan and Southeast Asian countries was concluded in 1986 when Japan submitted to the pressure of the other countries and finally lowered duty tariffs on a number of semi-processed and processed products such as plywood. The lower tariffs have been introduced in several stages. They were fully operational by April 1988. They are described in Figure 25.

The EC, the other major importing region, has a completely different strategy as far as tariffs are concerned. GATT's Most Favoured Nation (MFN) tariffs apply to very few, if any, tropical countries. Most of them are dealt with under UNCTAD's Generalized System of Preference (GSP), whereby the MFN clause is waived in favour of developing countries, and preferential tariffs applied.

(Additionally, for some products, such as plywood, a duty-free quota is agreed. For the Least Developed Countries (LDCs) free access is granted for many products, although often this does not have a great impact, since these countries are unable to produce goods such as plywood.) Furthermore, under the Lomé Convention, timber products from Papua New Guinea, Caribbean countries and most African countries benefit from free entry into the EC.

The battle over tariffs between the US and Japan is only one aspect of the trade problems between the two countries. The other timber-producing nations, especially in Southeast Asia, have been protesting about Japan's Protectionism for a long time. Since the early 1980s, Indonesia especially, through APKINDO, has been attempting to obtain the same treatment from Japan as it and others receive under the GSP from the EC.

Figure 24b – Papua New Guinea log exports to Japan 1985-1987: the difference between trade statistics

	PNG volume estimates	Japan volume estimates	Difference in volume	Difference in volume
1984	628.9	523.0	-105.9	-20.2
1985	696.5	734.1	+ 37.6	+ 5.1
1986	732.7	774.6	+ 41.9	+ 5.4
1987	866.6	948.6	+ 82.0	+ 8.6

Sources: National Trade Statistics

Figure 25 – Wood products tariff reductions in Japan: 1986-1988 (in %)

Description (with CCCN)	January 1986	April 1987	April 1988
Veneer 44.14-230/290	15.0	5.0	
Plywood:	16.3	12.5	10.0
– processed 45.15-111			
– softwood 45.15-191	15.0	12.5	10.0
– hardwood 3mm 44.15-192	20.0	17.5	15.0
– hardwood 3-6mm 44.15-193	20.0	17.5	15.0
– hardwood 6-12mm 44.15-194	17.0	13.5	10.0
– hardwood greater than 12mm 44.15-195	17.0	13.5	10.0
Reconstituted wood 44.18-100	12.0	8.0	
Pine lumber:	7.0	4.8	
– unfinished 44.05-310			
– finished 44.13-300	10.0	8.0	
Laminated lumber 44.15-200	20.0	15.0	
Wooden beading and mouldings 44.19-000	7.2	4.8	

Source: Asian Timber, Feb. 1986

Chapter Four: Securing Timber Supplies and Learning the Aid Trade – Japan's Economic Intervention in Tropical Countries

The pattern of Japanese investments in the forestry and timber industries of tropical countries has greatly changed since the early 1960s. More recently, Japanese aid policies ("Official Development Assistance" or ODA) has changed too. This will affect tropical forests.

This chapter aims to chart these changes and demonstrate the ability of Japanese aid and foreign investment policies to adapt to changing conditions. The most recent changes concern the concentration of direct forestry investment on chip operations (as opposed to logging), and the rapid financial increase in aid (from US\$3.5 billion in 1985 to US\$8 billion in 1988). Until now there has been no framework for support and evaluation. A joint JICA/OECF (Overseas Economic Co-operation Fund) report on integrating environmental aspects into development assistance was published in December 1988 (JICA, 1988). Unfortunately, until the recommended procedures are in place, environmentally unsound Japanese aid projects will continue to be developed.

4.1 Investments in Tropical Forest Exploitation

The problem of securing regular commodity supplies in sufficient quantities has been a Japanese obsession since the beginning of the century. The country's inadequate resource base is at the root of this.

After the war, and having lost its colonies, Japan found itself in a particularly serious position. Part of the domestic primary resource base had been overexploited and depleted, and Japan urgently required materials for reconstruction. The economic growth which followed the war continued until the early 1970s, and meant that demand for raw materials remained at a high level. As commentators have explained:

Dependence on foreigners for the necessities of life is the economic basis for a pervasive sense of national insecurity at all levels of Japanese society, even though the ratio of imports to gross national product is not as high as in many other countries. Occasional interruptions of supply by the deliberate action of foreign countries, such as was recently the case with soybeans, steel scrap, and petroleum, reinforce this feeling (Krause & Sekiguchi, 1976).

During the reconstruction period of the 1950s and the "high growth" period which began in the 1960s, Japan secured its supply requirements by taking control of or investing in foreign companies involved in resource exploitation and primary processing.

However, the forms of overseas direct investment aimed at corporate or trade control have changed considerably since the early 1950s. In the 1970s, the main aims of these investments switched from security of primary resources and the establishment of trade infrastructure, to manufacturing and trade. More recently, the emphasis has been on manufacturing for foreign markets. Securing basic resources has never been neglected though, and every cost-effective opportunity is still taken.

4.1.1 Patterns of Japanese Overseas Investments and their Role in the Tropical Forestry Sector

The creation of the Alaska Pulp Company – a joint venture between Japanese and US interests, still in existence – was one of the first investments to be made after the end of the Second World War (Japan started undertaking capital transactions again with overseas countries in 1951). Somewhat ironically, the same wood-related sector (pulpwood chips), today accounts for a great proportion of overseas forestry investment.

However, between 1950 and 1970, most wood-related investments in tropical areas were made in logging. Investments in processing – either veneer and plywood mills or sawmills – did not become significant until the 1970s.

Figure 26a shows the progression of total Japanese overseas investments from 1951 to 1982. The first period, from 1951 to 1962 was characterized by a relatively low (by today's standards) yearly level of overseas investments, which concentrated on primary resources (more than 44% in mining).

During the following decade, overseas investments accelerated. Investments to secure non-oil primary resources were actively pursued, particularly in Asia. In 1968, the adoption of a capital liberalization policy created the conditions for a further increase in such investments. This was made possible because balance of payments problems appeared to be a thing of the past (Takeo Tsuchiya, 1984).

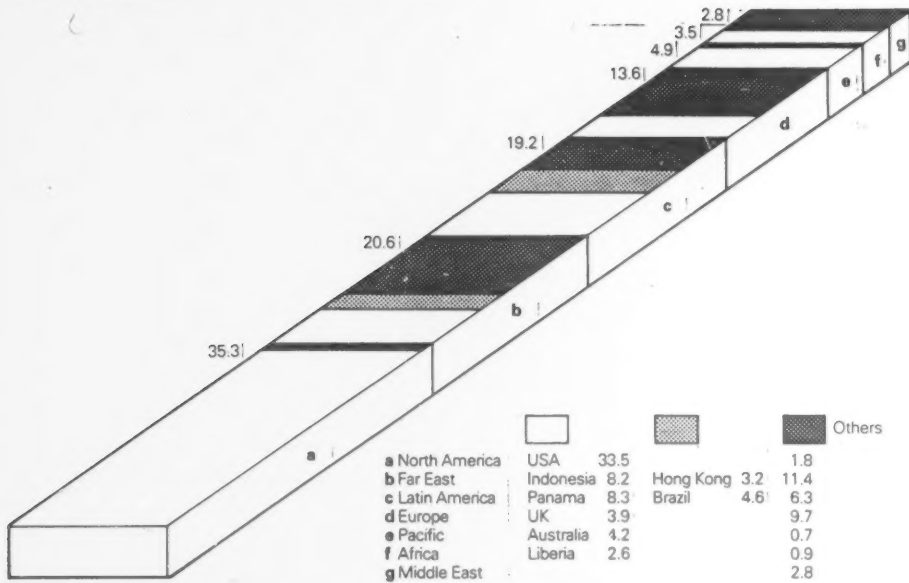
The first overseas investment boom occurred in 1972-73. Until then, the Japanese corporate sector's level of overseas direct investments had been far lower than that of other industrialized nations.

Investments in the two years (1972 and 1973) came to US\$3.5 billion – more than the total for the 21 years between 1951 to 1971. In other words, in the space of these two years the amount of investment overseas more than doubled (Takeo Tsuchiya, 1984).

Direct investment was particularly marked in Asia (the first time that this region became the focus of Japanese investments) and North America, and concentrated mainly on manufacturing, trade and finance. But this boom was interrupted by the

Figure 26: Japan's Direct Overseas Investments

(a) Geographical Distribution: Cumulated from 1951 to 1986
(Figures are % of total)



(b) Investments in Indonesia Requiring Government Authorization
(Figures in US\$ millions)

Year	Total Investments		Forestry		Wood & Paper	
	Number	Initial Investment	Number	Initial Investment	Number	Initial Investment
1967	2	3.7				
1968	9	15.5	3	5.0		
1969	16	115.4	2	3.0		
1970	28	37.2	1	1.0	1	1.1
1971	27	122.1	1	2.0	1	0.8
1972	21	76.7	4	13.5	1	3.0
1973	47	279.9	2	23.2	5	3.9
1974	33	449.3			2	8.2
1975	20	937.4				
1976	7	39.5				
1977	7	21.8	1	1.4		
1978	13	47.1	2	10.8		
1979	2	12.6				
1980	5	29.8			1	6.5
1981	5	76.3			1	8.6
1982	11	532.2			1	1.3
1983	12	457.5				
1984	2	31.1				
1985	9	62.9				
1986	10	266.7				

Note: This table only records the initial investment of projects; in most cases, this represents only a proportion of the venture. Long-term loans and a number of investments in existing ventures are not recorded. Wood and paper are processing industries.

global economic crisis which precipitated Japan's so-called "stable-growth period". For the following four years, overseas investment levelled off.

From 1977 onwards, Japan experienced a period during which the value of the yen increased rapidly. This was short-lived, but together with the quick recovery of the Japanese economy after the second oil crisis, triggered a new growth period for overseas investment. After three years of remaining at around US\$4.5 to 5 billion, overseas investments shot up to nearly US\$9 billion in 1981. This was in fact the start of a new period, characterized by the acceleration of the manufacturing industry's "delocalization". Japanese manufacturers invested either in countries with low labour and resource costs, or in industrialized regions such as North America and Europe which are close to their potential markets). Direct financial investment (for instance in US Treasury bonds) also became significant.

Trends relating to direct investment in overseas timber do not follow the movements described above. Indeed, since their heyday in the 1960s and 1970s, there has been a reduction in the number and amount of total direct investments in logging and timber processing. A typical example is Indonesia, which has been and still is the main Asian recipient of Japanese investment, largely because of the massive resource exploitation projects developed in the 1970s. Timber formed part of this process. Figure 26b gives the figures for Japan's total Asian investment flows between 1951 and 1982, total investment flows to Indonesia, and direct investments in forestry and wood industries in Indonesia.

Tropical Timber Investments: the Indonesian Case

Timber industry investments constitute a very small proportion of total Japanese investment in Indonesia. They were mostly concentrated between 1968 and 1973, although some were also made at the end of the 1970s and at the beginning of the 1980s. One of the most common ways in which Japanese traders secured supply was by providing credit facilities to an existing local company. Sometimes the trader would take a small shareholding, but this principally served as a guarantee that the credit would be repaid in logs. This system has also been extensively used in the Philippines and places such as Sarawak.

Figure 26b records only those investments which had received government approval. Others did not require approval, or alternatively, approval was not sought for them. For instance, furniture manufacturing investments are not recorded. Nevertheless, some idea as to the underlying trend of forestry investment in Southeast Asia can be gleaned.

The history of Japanese involvement in the Indonesian forestry and timber sector reveals the strong link between the Japanese administration and private sector, especially

in the case of Kalimantan, on Borneo. Even in the late 1950s, Japanese traders were fully aware of the destructive practices used by loggers, and of the impending exhaustion of timber reserves in the Philippines. Yet they went ahead with plans for the exploitation of Kalimantan's virgin forests. In 1959, the South Seas Forestry Development Committee, which represented the interests of large pulp, timber and trading companies, met with the Japanese and Indonesian governments and organized a survey of Kalimantan's forest resources.

In 1961, a report proposing the "development" of Kalimantan was published. It suggested that aid loans could be channelled from the Overseas Economic Co-operation Fund (the Japanese overseas public bank, OECF) through a special development organization which would organize the areas of forest to be exploited.

The Kalimantan Forestry Development Co-operation was accordingly created in 1963. An agreement between the Indonesian and Japanese governments was signed. Japanese loans worth US\$120 million were agreed. 80% of this financial commitment was made by OECF (Japan South Seas Timber Association, 1976).

Kalimantan's development in the late 1960s and early 1970s, which appeared to be a boom provoked by market conditions, was in fact carefully engineered from Japan by public and private interests. The feasibility study and much of the necessary survey work were undertaken by the OTCA, a technical aid body and JICA's predecessor (see Section 5.2).

Logging in Kalimantan was initiated by Mitsui in 1963. By the beginning of the 1970s larger scale logging operations had been established. For example the South Kalimantan Development Corporation was set up in 1973 with Japanese private capital and government loans. The company eventually went into debt and was sold off to a group of companies that included Sumitomo Forestry and Mitsubishi. At this stage, Sumitomo was probably the company most heavily involved with Indonesian forests. At one point it had interests in over 20 timber related firms in Indonesia. Sumitomo was one of the few companies to retain a presence in Indonesia after the log export ban had been imposed in 1986.

From the mid-1970s, the Indonesian government stipulated that logs extracted by exporters must be processed in Indonesia. It also ruled that overseas investors transfer a majority of shares to Indonesian partners. In fact, most of the Japanese companies which had invested in logging in the late 1960s and early 1970s, had their licences revoked in the early 1980s. Others, rather than invest in processing plants (such as plywood mills) simply sold out to Indonesian interests or to their partners. On a list drawn up by the Japan External Trade Organization (JETRO), which identifies 29 major Japanese investments in "Forestry and

Wood Products" – including plywood, joinery and furniture – there are five whose authorizations had been revoked by 1986. A further 12 sold out to local partners, and at least one became dormant (JETRO, 1986).

At the height of Japanese investment in Indonesia, all the major trading names could be found. Mitsubishi held 80% of P T Balikpapan Forest Industries Ltd, a logging company created in 1969 and sold to local interests in 1986. Tomen controlled 49% of P T East Kalimantan Timber Industries, a logging concern created in 1972 and sold in 1978. Mitsui owned 45.5% of P T Kalimantan Forest, a logging company in East Kalimantan whose licence was revoked in 1978, and also controlled P T Palembang Timber Development Co Ltd, a logging and sawmill company sold in 1985. (Mitsui still has other timber interests in Indonesia – see Appendix C).

Woodchip operations is another category of investment that has gained in importance since the mid-1970s. Japanese companies have become expert in the pulp processing of mixed hardwoods. A great deal of research has been carried out by government institutes, for instance at the Tsukuba Forestry Experiment Station (Wood Technology Division and Forest Products Chemistry Division, 1975), and at the Tropical Agriculture Research Centre (Usami, 1978). Such research, which started in fact during the 1960s, demonstrated that many tropical hardwoods were suitable for kraft paper (mostly used for packaging) and cardboard, although not for high quality paper. Mangroves (the pulp of which can be used to produce better quality paper) were especially targeted, as were Dipterocarps (Oka, 1968). This kind of research contributed to the development of projects undertaken by companies such as the Jant Co's pulping operation. This was the first large project "won" by the Papua New Guinea authorities in the 1970s.

The main features of Japanese investment in forestry products have changed little during the last three decades. The desire for control – with no strings attached – of a given resource base, combined with the search for maximum profit yield in the short term, have acted and continue to act as the main thrust behind any investment. Instances where Japanese firms have contributed to the development of forestry industries in other contexts or investment policy frameworks are extremely rare.

4.1.2 Current Investments: Pulp, Logs and Processing

Japanese investments in commercial forestry activities have slowed down considerably since the early 1970s. Producing countries have tried to limit the control exercised by overseas investors over their natural resources. Nevertheless, there are still many Japanese companies and investments connected with the Southeast Asian timber industry.

Since it is difficult to provide a full list of operating concerns, and keep up to date with the history of each investment, we have decided to describe three particular cases. The first concerns mangrove forests. These represent an ecological system which has been hit particularly hard by the destructive logging practices carried out in Southeast Asia during the past two decades. The other two relate to projects which have become notorious due to their negative environmental and socio-economic impacts, namely, the Jant pulp programme in the Gogoi area in Papua New Guinea, and the Cellophil logging, pulping and rayon integrated programme in the Philippines.

Mangrove Exploitation

Mangroves have already been destroyed extensively in countries such as the Philippines, where only 25% of the country's original mangroves remain (Gomez, 1988). Japanese traders have been interested in mangroves since the 1930s – high-quality paper can be produced from their wood. In the Philippines, the conversion of mangroves to woodchips destined for Japan started twenty years ago.

From 1966, mangrove logs were imported from the islands of Mindanao and Palawan. But after 1973, the Moro rebellion and activities by anti-government guerillas caused a deterioration in the production environment, and although there were imports in 1974, they were interrupted thereafter (Kami Pulp, 1985).

Since then, Philippine mangroves have been subjected to many destructive practices. Some of these have directly served Japanese consumer habits. Shrimp farming has been particularly disruptive. Numerous joint ventures between Japanese fishing firms and Philippine interests have been established (JETRO, 1982). In most cases shrimp farming, as currently practised in clear-cut mangroves, is a speculative and unsustainable venture. It has been described as "senseless" by a UNDP/UNESCO programme officer (Vanucci, 1988).

Woodchip operations have a lifetime of 15–25 years. They should leave the so-called "mother-trees" untouched, so that the area can regenerate. Buffer zones along water channels and some parts of the forest should also remain untouched to ensure the preservation of the forest's complex ecological balance. Additionally,

debris should be cleared and seedlings properly tended to encourage full regrowth. However, it appears that woodchip operations have been conducted with little, if any, care and many mangrove areas have been totally destroyed.

Indonesia, particularly the area formed by Sumatra and Kalimantan, is surrounded by some of the world's largest and most unspoiled mangrove and wetland forests. Large-scale timber extraction began in the 1970s and is increasing. In the mid 1980s, more than 2,000km² (4% of the total) of mangroves were logged for woodchips. This produced approximately 250,000 m³ of chips per year. These were mostly for Taiwanese and Japanese markets (Fortes, 1988).

In Malaysia, mangrove chip processing operations started in the late 1960s. In 1970, in Sabah, 1278km², or 40% of the total mangrove area, were set aside for the production of woodchips, to be exported to Japan (Fortes, 1988). Kohjin Co., a Japanese company, established two operations, via local subsidiaries. One of these was set up in Sabah (Sharikal Bakau Sabah) in 1971. The other, in Sarawak, was created in 1968 (Sarawak Woodchips Co Sdn Bhd), but has apparently closed down. At one time it had a concession, and operated a chip plant, which handled mangrove logs, in the Rajang delta. The Asian Wetland Bureau recently noted that:

In general, wood chipping has been extremely deleterious in mangrove areas. The Rajang Delta of Sarawak (the largest mangrove forest in the state) was clear-felled for wood chipping in 1969. It has not recovered. In 1986, the Sabah State Government banned the export of woodchips after reports showed that the forest was not recovering (Parish, pers com, 1988).

Box Nine: Mangroves

Mangroves form one of the most extraordinary ecological formations found in the coastal lowlands of the tropics. Neither sea nor land, they consist of trees with flying buttresses, are adapted to brackish salt waters, and interact with a complex and rich ecology (Chapman, 1975). They also provide rich fishing grounds and are immensely resilient to the elements, and even to single destructive events such as limited clear-cutting (Ong, 1982). They also help protect inland agricultural areas from tropical storms. But the cumulative effects of industrial sea pollution, overlogging, fish and shrimp farming, fragmentation, dredging and industrial and agricultural land reclamation, threaten their continued existence.

Mangroves have been estimated to cover an area of 15.5 million ha, but this is probably a gross over-estimate of what is actually left (Lanly, 1982). Although found throughout the tropics, the largest forests are situated in tropical South America (3.5 million ha), West Africa (1.6 million ha), south and Southeast Asia (6.3 million ha; two-thirds of this in Southeast Asia). In Southeast Asia, the largest mangrove forests are found around Malaysian, Papua New Guinean and Indonesian islands (Fortes, 1988).

The ecological and environmental importance of mangroves is phenomenal. According to the FAO:

One category of closed broadleaved forests merits particular attention, partly because of its products but especially for the special services that it renders. The category is that of the mangrove which is unfortunately, for the most part, subject to degradation and elimination processes especially through over-logging for firewood and small wood and for the extraction of tannin (Lanly, 1982).

Whitmore, in his recently revised classical study of Malayan tropical forests also expresses concern about the future of mangroves:

Chips have been produced from mangrove forests, mainly *Bruguiera* and *Rhizophora*, in Sabah and Sarawak. The precaution to leave unfelled forest along creeks has not been fully observed and the total removal of all trees from extensive areas has eliminated the seedling source for regeneration so that large expanses of bare mud have been created ... Massive chip production is planned from the huge mangrove forests of Irian Jaya and elsewhere in Indonesia (Whitmore, 1984).

in 1972 the MDI consortium, made up of several leading Japanese pulp and paper companies (such as the Jujo Paper Co, Kanzaki Paper Co, Sanyo-Kokusaku Paper Co, and the Oji Paper Co) also established a mangrove chip operation in Sabah (Jaya Chip Sendirian Bhd). Apparently, this company's operations had already been terminated by the early 1980s. The Toa Kigyo company created another mangrove chip operation in Sabah (known as the Toa Kigyo Co (Sabah) Ltd) in 1966. This operation was closed down some time ago. In Indonesia, MDI holds 70% of P T Chipdeco. This is a mangrove chip production project, established in Tarakan, Kalimantan as a joint venture in 1977 with an Indonesian interest (P T Karya Kencana). Researchers from the Japan Tropical Forest Action Network (JATAN) recently visited the Tarakan area, now a scene of devastation. Large shrimp ponds had been established in logged over areas, eliminating any chances of regeneration.

Despite the well-known negative effects of recent logging, some Japanese companies are setting up new mangrove operations. Bintuni Bay, on the Western end of Irian Jaya (New Guinea), in Indonesia, was described by the professional journal of the Japanese pulp industry as being the only remaining undeveloped mangrove resource large enough to provide sufficient logs for the operation of a modern chip factory (Kami Pulp, 1985). In recent years, part of the area surrounding Bintuni Bay has been carved up into concessions. For example, P T Agoda Rimba, an Indonesian company, exploits a 180,000ha concession in the Babo area of the bay, and started to export to Taiwan in 1987.

In 1988, a contract was signed between the Marubeni Corp and a local Chinese concern, the Pirigardi group, which has been allocated a concession of 137,000ha in the south of the bay (Nihon Keizai Shimbun, 1988). A loading harbour and a chip factory are being built. Marubeni will import all the chips produced – 300,000 to 400,000 tons per year – as from mid-1989, and will sell them on 10 year sales contracts to leading paper making companies. The total capital expenditure is expected to reach US\$7 million, of which US\$3 million will be provided by Marubeni. Several client companies are part owners of MDI, as noted above (Kanzaki Papermaking Co, Sanyo Kokusaku Pulp, Nakagoe Pulp Ind). It is also expected that some of the production will be sold to South Korean and Taiwanese companies.

It appears that the concession allocated to the operation overlaps with the 450,000ha Bintuni Nature Reserve. This was established in 1982 and contains 270,000ha of mangrove reserves. Although an environmental impact assessment (EIA) has been carried out on the project, it has never been made available to the public. MITI, which is responsible for pulp and paper policies, recently responded to an enquiry made by the Hon Nobuyuki Sekiyama, a member of the National

House of Representatives, by saying that there are no environmental problems with the project.

The production plan is extremely short – 10 years – during which 10–15 million tons of logs will be extracted. The cutting methods are to include, as usual, the protection of "mother-trees" and a shoreline tree border. Supposedly, this will be sufficient for "natural regeneration". The economic pressure on logging contractors and workers is high in such operations, and mother trees are frequently cut and shorelines opened. This has resulted in the dessication of large mud areas and the destruction of the ecological integrity of the mangrove system to such an extent that regeneration is impossible. It should be pointed out that the idea that natural regeneration is possible within 15 years, is disputed by many specialists. They consider the necessary period to be 20–25 years, and that in many cases, regeneration requires human intervention and planning.

The Jant Operation in Papua New Guinea

The clear-cutting operation undertaken by the Jant Co in the Gogoi Valley area of the Madang district of Papua New Guinea, is a typical example of just how economically, socially and environmentally misguided this type of project can be.

Jant Pty Co (Japan and New Guinea Timber Pty Co) was incorporated in Papua New Guinea in 1971. Honshu Paper Co, which is itself an affiliate of the giant Mitsui trading group, holds 92.5% of its capital. Some of its shares are held by other "big name" Japanese companies, such as Nomura Securities and Daiichi Kangyo Bank.

The Australian colonial administration had bought the local people's timber rights to the Madang area as early as 1963 (Smith, 1984), but it was not until 1968 that negotiations started with the Japanese group. The operation was conceived as an integrated project involving the clear-felling of large sections of the 67,000ha concession for mixed hardwood chipping. Part of the logged area was to be replanted with fast growing species (*Eucalyptus deglupta*), and another part of it was to be used for an agricultural development project. This project was planned as a joint venture between the local people, local authorities and Jant, and would, the government hoped, be co-financed by the company.

A veneer mill, a sawmill (this exists, but exports very little) and eventually, a fully integrated pulp and paper mill, were also planned. Modern services and roads were to be installed and maintained for the 2,000–4,000 people living in the area. These were mainly traditional shifting forest garden farmers, and it was expected that a number of them would find work with Jant.

It was anticipated that the programme would require 270,000m³ of logs annually. The mixed hardwood chips were to be exported to Japan.

and other countries (for example, Taiwan) for cardboard for packaging.

The logging operations started in 1973. Yet even though sixteen years have passed, few of the desired aims have been achieved. One expert commented that the Gogol project:

... is a case history of a development project in a poor country, one in which the host has had to pay much higher costs than were originally estimated ... It is also a case-history of a development project in lowland tropical rainforest, an environment that is well understood neither in general biological terms, nor as a human environment. Finally, Gogol is an object lesson: by identifying the mistakes of Gogol we may not have to repeat them elsewhere (Seddon, 1984).

The project has failed on several counts. For example, reforestation has been very slow. The agreement was that at least 800ha would be replanted every year, with Honshu bearing the costs. It was hoped that 20,000ha would have been replanted after 20 years. In reality, only 4,755ha were replanted during the first 10 years, less than 10% of the cleared area (36,255ha by the end of 1983). Contrary to claims made at the start of the operation, nobody had any idea of what the replantation programme would entail. In fact, in September 1974, the Papua New Guinea government requested that the Japan International Co-operation Agency (JICA) carry out a pre-feasibility study (completed in 1975) and a feasibility study (published in early 1977). This was so that a field study could be carried out. The field study would itself seek to establish an effective means of reforestation and "make a reforestation plan for the area" (JICA, 1977). In other words, the 1973 contractual arrangements concerning reforestation were built on purely notional grounds.

The duration of the operation will actually be far shorter than originally intended. This is partly due to revisions of the original logging plan, which took little account of environmental needs. Some areas are now considered too fragile or too important to be logged. Moreover, the amount of exploitable biomass was overestimated. Consequently, the duration of the project is likely to be no more than 18 years. (Down from a planned 20-25 years.) The amount of chips being exported is already decreasing rapidly, plunging from an average of 199,000m³ per year between 1977 and 1980 (Office of Forests, 1982), to 101,600m³ in 1987 (Timber Digest, 1988). This is due to reduced demand for mixed hardwood chips in Japan and resource depletion.

The local environment has already suffered degradation, and the long-term impact of the project is still unknown. Replanting did not take place at the planned pace and agricultural developments have not even remotely proceeded as hoped. Logged-over areas have been left bare or, more precisely, covered in debris, to

regenerate themselves. The new growth is poor and much less diverse. Waterlogging and compaction have occurred, and grasses have invaded logged-over areas. The Gogol area is itself an "advanced secondary lowland tropical forest", having suffered extensive fires twice in the first half of this century (Sauler, 1984). The problem now is that destruction of the previous cover is absolute. Full regeneration of the forest would require that the area be left totally undisturbed.

The local people have not received what they were promised and they have benefitted little from the operation. The sums received as royalties from clear-felling have been negligible. In 1984, the annual payment in the Gogol Timber Rights Permit area amounted to Kina 10 per person (Smith 1984), equivalent to a mere US\$11.2. Little employment has been offered to local people, and customary land rights have been constantly seen as obstacles to industrial development, rather than as an important economic and social feature which must be integrated into the project (De'Ath, 1980). Since agricultural development has not proceeded at a sufficient pace (despite a small development of agroforestry), local people have had to continue forest garden cultivation. Yet this has been made very difficult because debris resulting from clear-felling has not been removed, and vines have grown quickly.

This is not to say that villagers have experienced only losses. Communication, for instance, has vastly improved. But as Seddon summarizes:

What have the villagers lost? Above all, their forest, and what it had meant as a source of food, building material and social security (Seddon, 1984).

During the late 1970s, the Japanese authorities, particularly JICA, did not see the relationship between local communities and the project as a two-way process. In the feasibility study report published by JICA in 1977 for the reforestation programme, the local culture and economic structure were indirectly referred to as an obstacle to change. The reference to "participation of people living in the proposed reforestation area" is an empty public relations phrase, rather than a reference to a desire for genuine participation:

Establishment of a strong public relations program would be of considerable importance in helping local people to understand the fact that the reforestation would contribute not only to their own welfare but also to the socio-economic development of the area. The promotion of their understanding would also be useful to solving the land lease problem, promoting their shareholding of the reforestation company, and getting their co-operation in protecting the plantations from fire or other damage (JICA, 1977).

The lessons of the Gogol project are clear. Neither the Papua New Guinea government, nor the Japanese corporation which planned the project,

had a clear idea of the characteristics of the area. They knew only that timber reserves were available for chipping. When the contract was signed they did not know if reforestation was even possible. This was a recipe for disaster. As Seddon states:

One major lesson from Gogol is very clear: environmental analyses are incomplete, almost pointless, unless there is an understanding of the people who live there, of their needs, aspirations, perception of their environment, of themselves, their past, present and future, of their economic imperatives and their political systems at every level from the local and provincial to the national. All of the forces, in other words, that modulate choice and change.

A second lesson is that the economic analyses of such projects should be comprehensive. If adequate ecological safeguards had been built into the original agreement, and the real costs of reforestation and government support through its agencies had been clearly displayed at the outset, it is doubtful that either Jant or the government would have considered this a financially attractive proposition.

The third major lesson is that land-use plans related to logging must be more than a paper exercise. They must be realistic, in the sense of being based on knowledge of land capability, of markets, and of the human capacity and aspirations in the region. The Gogol land-use plans met none of these criteria adequately and have therefore not been fully realized (Seddon, 1984).

The Cellophil Project in the Philippines

Cellophil is a very large venture in the north of the Philippines which produces cellophane and rayon for the Japanese market. It is a typical example of a large project which neglects social and environmental constraints. The project's foreign (Japanese) partners have permitted corruption and nepotism, and the environment and local communities have both lost out to commercial interests.

Cellophil was established in 1972 as a joint venture between large Japanese corporations (Mitsubishi Rayon holding 6% of the shares, and Daicel, 3%) and the Herdis group of companies, controlled by the Disini family. The head of this family, Herminio Disini, was a member of the small "elite" of Marcos' friends who carved up the profitable sections of the Philippine economy among themselves. He was particularly close to Imelda Marcos' own family (Bello et al, 1982).

Cellophil is in fact the common name of two sister companies: Cellophil Resources Corporation (CRC), and Cellulose Processing Corporation (CPC). The former was the original company. The latter was created to circumvent the ruling that timber concessions should not exceed 100,000ha. By the end of 1974, the two

companies had together secured 198,660ha of forest area for 25 years. Sixty two per cent of this consisted of Dipterocarpaceae-type forests, the remainder of Benguet pines (Schreiber and Schreiber, 1988). These concessions were spread over five provinces in Luzon, the most northern island of the Philippines, in the Cordillera region.

The venture had several aims. The most important of these was to extract 450,000m³ of logs per year from the forests and float them down rivers to processing plants where both the pulping and paper, cellophane and rayon manufacture would take place. The pulping plant was built in Tayum, in the Abra province, 7km from Benguet. A rayon processing plant was built further down in the valley. Pine logging started in 1973. In 1976, CRC started to clear and manage the rivers to improve log transport. Logged-over forests were managed either through "seed-tree" logging and the natural regeneration technique (20 mature trees per ha are kept for seeding, the rest is felled), or through replanting Benguet pines after clear-felling. A Forest Protection Plan, for the prevention of arson and illegal felling was also created. Protection teams were paid according to results. The teams differed little from the numerous other private militia which still flourish in the Philippines.

Two major problems arose. Firstly, local highland communities began to oppose Cellophil's activities (see Box 10). Secondly, the Filipino owner, Herminio Disini, had used his political "protection" to secure markets and contracts (Kraar, 1981). Later on, as Westinghouse's main middleman in the Bataan nuclear plant scandal, he became even more notorious. He was estimated to have collected as much as US\$35 million in "commissions". Westinghouse got the contract, but Marcos had to make a gesture and so "divested" the Herdis group of Cellophil stock, in effect nationalizing the company. However, Herdis was contracted to continue managing Cellophil.

Soon after, some of the new millionaires (such as Dee and Silverio) went bankrupt or fled after fraud or bad debts were exposed. In 1981, banks panicked and stopped short-term credit. The situation became difficult for all Marcos' "cronies", since international financial bodies and the World Bank (which had supported Marcos' industrialization policy) had become concerned about the level of corruption. As Fortune, the well-known financial magazine explained:

Of all the country's problems, the one that most seriously undermines the confidence of international bankers and investors is the high-level corruption that pervades Philippines life like jungle rot (Kraar, 1981).

Cellophil, and the other companies owned or managed by the Herdis group, ran into considerable cash-flow difficulties and needed government support (Gonzaga, 1981). The company managed to continue its operations until the fall of the Marcos regime in 1986. A number

of logging firms closely associated with the former power then lost their licences. They were some of the 148 firms, out of a total 220, which had not paid their licence fees. Cellophil Resources Corporation was one of those whose concession was cancelled (Asian Timber, 1986).

Box Ten: Cellophil – Links Between Social and Environmental Problems

Environmental and socio-political problems have been deeply intertwined throughout Cellophil's history. The areas in which the company's concessions are situated are home to several minority groups, who consider the forests to be their ancestral lands. The Tinggians, who practise wet rice cultivation, river fishing and livestock husbandry, form 35% of the Abra population. They opposed Cellophil's activities on several grounds:

- floating logs on the rivers was destroying the aquatic environment and ultimately the fish resource (Dorral, 1979);
- logging methods employed in the area were particularly damaging; areas of up to 60ha, forming part of fragile hill landscapes, were clear-felled, causing landslides, floods and water pollution which in turn threatened local communities;
- The people affected by Cellophil's operations have, as the basis of their present economy, irrigated rice farms. Supplementary to these are mountain swiddens, pastures for their cattle, the rivers which are a major source of protein and forests for timber, fuel, honey and game. The prospect of a major logging operation cutting a minimum of 3,000 trees a day (150 sawyer teams, each with a quota of 20 trees a day) made the Tinggians fear for their livelihood (Anti-Slavery Society, 1983).

The Tinggians were highly suspicious of Cellophil and its relationship with the President. In 1974, when a Presidential Decree was promulgated to reinforce protection of the "ancestral lands" of minority groups, Abra was specifically excluded from the application zone. The 1970 Forestry Administration Order which specifically recognized the rights of ownership of local communities over watersheds and culturally important areas was not applied. In any case, the 1975 Revised Forestry Code (Presidential Decree 705) and the 1979 Watershed Reservation Regulations (Presidential Decree 1515) simply defined the local traditional communities as "primitive tribes ... living primitively", who belonged to the same category as squatters, and damaged the forest resources which were deemed to belong to loggers and hydroelectric dam managers.

Cellophil started to fence off the land that it had managed to buy from some local people, in effect preventing others from gaining access to their own fields, and charging them with trespassing if they crossed the corporation's property. The local population put up some resistance. The number of forest fires increased considerably, especially in 1977. After unsuccessful attempts to negotiate with Cellophil, the local communities signed an "intertribal pact", the first ever, in order to present a common front in their opposition to Cellophil.

The opposition between the two parties has since continued. Resistance to the corporation's activities has been supported by other groups all over Luzon. The problem is made more dramatic by the fact that Cellophil is not the only large company with foreign ties which is involved in logging or other programmes detrimental to the environmental and social integrity of these regions. Companies with US connections have carved up significant areas in concessions. In Luzon, for instance, the Benguet Corporation, an old mining company, has acted as a "mainstay" of US interests in the Philippines, controlling a 73,000ha concession in the Cordillera (obtained in 1984, and valid up to 2003). It also indirectly controls a further 69,000ha through its Heald Lumber subsidiary.

Large hydroelectric dam projects also threaten the local people's way of life. The use of watersheds is being denied to them, so that water resources for electricity ventures are "secure".

The Current Extent of Japanese Tropical Timber Interests

In the following pages, we briefly summarize the current extent of Japanese forestry interests and timber activities in some of the main Southeast Asian countries. A list of interests, classified by countries, is given in Appendix C. This should not be considered a full survey, but a sample, showing the extent of such interests. And it should be remembered that frequently, Japanese control of logging interests is obtained not through corporate ownership, but by financing an operation, supplying equipment, purchasing logs and controlling export operations. But even within these limits the following list of operations gives a useful picture of how Japanese interests are spread through the various countries.

In the Philippines, many of the existing interests, which originated in the logging operations of the 1960s and bear the most prestigious Japanese corporate names, are now empty shells. The export market has been greatly reduced, and the domestic market is stagnant.

As seen in Appendix C, Japanese companies are also involved in a number of plantation ventures. Smaller firms with Japanese interests, which either carry out logging and primary processing, or produce wood products such as chopsticks, rattan furniture and other handicrafts, also exist in the Philippines.

Some of the Japanese who established themselves in the 1950s and 1960s, collaborating with Filipinos to exploit concessions and serve the Japanese market, have shareholdings in sawmills. For example, Asian Timber Factors Inc is a small logging and sawmilling company in which three Japanese people each hold 2.5% of the stock. Japanese minority shareholdings of this nature, represent a way in which investors can maintain a strong foothold in the operations of companies whose products are destined for the Japanese market, without drawing attention to themselves. Nevertheless, some Japanese investors have large stakes in Philippine companies. For example, two Japanese hold 54.5% of the shares of Rikko Wood Industries Inc, which produces chopsticks.

The situation in Papua New Guinea's commercial forestry sector was discussed earlier. Ever since the 1979 forestry policy opened up the country to timber operations financed by overseas investors, foreign interests have been very powerful. Some of the very large concessions are held by Japanese interests, particularly those in Open Bay, Stettin Bay and New Ireland. Forestry has caused serious environmental damage in these areas. In some cases, the costs of building roads have been subsidized by Japanese overseas development assistance.

Virtually no Japanese interests that still hold joint ventures with local companies for logging operations remain in Peninsular Malaysia, Sabah or Sarawak. However, the Japanese joint ventures for timber processing (for example those that exist in Sarawak for veneer milling) may increase, since Sabah and Sarawak are shifting their policies towards local processing to increase levels of value added exports. But half of the concessions are in the hands of the Sabah Foundation, and in the early 1980s many local loggers received only short-term licences. Basically, these licences authorized the catastrophic and destructive mining of logged areas.

In Indonesia, new government regulations (in the mid-1980s) meant that most Japanese interests were either closed down or sold to local partners. But despite the fact that their importance has been considerably reduced since the early 1980s, Japanese investment operations have remained active in the Indonesian forestry products sector.

It should be noted that the control of forestry or processing operations does not always require control of part of the equity. For instance, earlier on in this chapter, the short description of the Bituni Bay woodchip project showed that Marubeni controlled the commodity through initial capital outlay and by disposing of the product on the regional market.

The example of Indonesia is interesting since it reveals the same trends for Japanese timber processing overseas investments as for other sectors. In other words, Japanese corporations now prefer to invest in processing industries, rather than import raw materials into Japan.

For instance, the Mitsui Corporation which already owns, together with Mitsui Timber, a 49% share in the Katingan Timber Company (KTC) (created as a plywood joint venture with three Indonesian partners in 1973), very recently invested US\$10 million in a forest development project. The reason for this is that the current concession of 110,000ha is nearly exhausted, and a new concession of 112,000ha has been secured by an Indonesian partner in central north Kalimantan. The concession contains both hill meranti and kapur and it is estimated that 4.2 million m³ of logs are available for extraction. An all-weather road is to be opened and transport facilities organized (Nikkan Mokuzai Shimbun, 1988e).

Shifting Investments: the Move Towards Brazil

Brazil is also increasingly important as regards Japanese investments and tropical forests. The situation is complex (but analysis of it is outside the scope of this report). As far as timber products are concerned, three types of investment can be found. Some of these centre on pulp and paper making, mostly using wood from pine and eucalyptus plantations in states south of the Amazon region. Others concern wood processing (joinery, furniture making, sawmills, etc) and these too are found principally in southern and central Brazil, rather than Amazonia. Finally, some investments involve forest processing operations which are integrated with regional development. These are found mainly in the Amazon region which has become fragmented due to large, internationally funded projects. Some of these are now well-known, for instance the Grande Carajas project, or the Power Sector programmes which organize the construction of large dams which are funded partly by the World Bank, partly by the commercial banking sector and partly by Japan.

Huge areas of the Amazon have been affected by the Grande Carajas project. Clear-cutting and reforestation in eucalyptus for producing charcoal (for iron-smelters in the area, which are very inefficient) have destroyed vast tracts of rainforest. These projects are also problematic because of the way in which they interact with other projects – such as large dams, mining operations, and rail and road links – in the same area.

4.1.3 Investments and Forest Management

The involvement of Japanese corporations in tropical forestry activities is extremely varied, but it often has a direct impact on forests. Many commercial forestry management systems have been developed for tropical forests, especially in Southeast Asia, where high density Dipterocarp stands are well suited to intensive extraction and long-term management. For a long time, governments and forestry departments have been inserting clauses relating to enrichment planting and reforestation into logging licences and agreements. Most logging licences contain relatively strict rules concerning felling techniques and volumes, watershed protection, and the construction of logging roads. Sadly, these management systems and logging licence constraints have been largely ignored.

Japanese corporations have usually failed in their attempts to make logging companies – who have demonstrated widespread reluctance to do more than the strict minimum – follow long-term management practices. Uncertainty over the long-term future of concessions is usually the excuse given for this. Weyerhaeuser is one of the few companies which has made positive attempts to regenerate forests. Unfortunately, its attempts to plant Dipterocarps in Indonesia have so far failed.

It appears that Japanese companies have not made any attempts to regenerate forests. They have, however, generally complied with the minimum legal requirements of the Forestry Codes. The only so-called "tropical forestry" undertaken by private Japanese companies has been monospecies plantation for pulp or sawnwood.

4.2 Japanese Aid: a Growing but Still Uncertain Role

For many years, Japan was seen to be lagging behind other industrialized nations in terms of development aid to Third World countries. Its Official Development Assistance (ODA) was small in proportion to Japan's wealth and, in common with many other "donor" countries' aid policies, was seen simply as a tool for helping the country's firms to penetrate foreign markets and win contracts. But this situation is changing. At the Toronto summit meeting of the heads of state of the seven richest nations held in 1988, the Japanese prime minister announced that his country was about to become the largest aid donor in the world (Le Monde, 1988).

This development in Japanese foreign policy raises many questions, and Japan may experience serious difficulty in adapting its aid institutions and procedures to the new situation. These institutions are widely dispersed, badly staffed, and relatively powerless in relation to other Japanese institutions. They have little experience in developing and assessing aid projects, and will find it difficult to establish procedures that guarantee that aid is not used (as it has been in the past) as a funding channel for the marketing activities of Japanese transnational corporations and large building contractors involved in infrastructure and industry super-projects.

To gain a greater understanding of the relevant issues in forestry-related aid programmes and policies, we will first look at the international aid institutions, and how they work and relate to the real centres of power. We will then take a closer look at issues related to tropical forestry.

4.2.1 The Main Characteristics of Japan's ODA

Japan's general ODA budget rose to Yen 701 billion in 1988 – an increase of 6.5% over 1987, and more than 12.5% over 1986. If expressed in US dollars, the growth of Japanese ODA looks even more impressive. Due to the appreciation of the yen, it increased from US\$3.8 billion in 1985 to more than US\$5.6 billion in 1986 (Ministry of Foreign Affairs, 1988), to US\$7.45 billion in 1987 (Financial Times, 1988), and finally, to around US\$8 billion in 1988 (Nihon Keizai Shimbun, 1988b). The ODA budget for 1989, which shows a 7.8% increase over the previous year's budget in yen terms, will reach US\$11 billion, way above the US fiscal budget of US\$9 billion.

The objectives of the Third ODA Plan, which aimed to double Japan's volume in US\$ between 1986 and 1990, and reach a five-year cumulated total of US\$40 billion, have therefore already been achieved. The "Fourth Medium Term ODA Plan 1988-1992", aims to increase the proportion of ODA in the Japanese GDP to 0.35% and release more than US\$50 billion.

Nevertheless, in terms of ODA/GDP percentage, Japan is still not particularly generous, being ranked only 15th out of the 18 members of the OECD's Development Assistance Committee (DAC) (Ministry of Foreign Affairs, 1988). Moreover, the 0.31% of 1988 is still very far from the 0.7% which is the accepted target of the DAC. (The DAC comprises the main 18 ODA donors of the industrialized world.) To reach its current level, Japanese ODA had to be multiplied by a factor of four over the past ten years. (US and UK aid were multiplied by 2.1 and 1.6 respectively during the same period.)

According to this new ODA plan, the proportion of grant aid within the total ODA should increase and softer conditions be applied to yen finance. For instance, credit could be given in dollars in order to lessen the effect of yen appreciation on the cost of reimbursement and interest payments. The burden of the Less Developed Countries (especially in Africa) should be reduced. (At the Toronto meeting it was revealed that a substantial package of existing loans worth US\$5.5 billion would be written off in favor of the 41 African LDCs. Additionally, cultural exchanges and technical co-operation ("software assistance") are to be promoted. Finally, aid will be used to promote "peace and stability" (for instance, by working on refugee issues.) These goals represent substantial changes to previous practices and it will be interesting to follow their implementation.

General Structure of Japanese Aid

Generally speaking, Japanese aid to the Third World falls into one of four categories. The first two comprise bilateral and multilateral Official Development Assistance (ODA, see Figure 27). The third is made up of the other official flows (for instance the export credit facilities and financing facilities provided by the Exim Bank and the Overseas Economic Co-operation Fund (OECF) to overseas private investments). These are mostly bilateral in nature (but the two aforementioned institutions also fund World Bank and Asian Development Bank (ADB) investments). The fourth category consists of private flows and includes all the credit funding and capital investment flows by Japanese individuals and corporations.

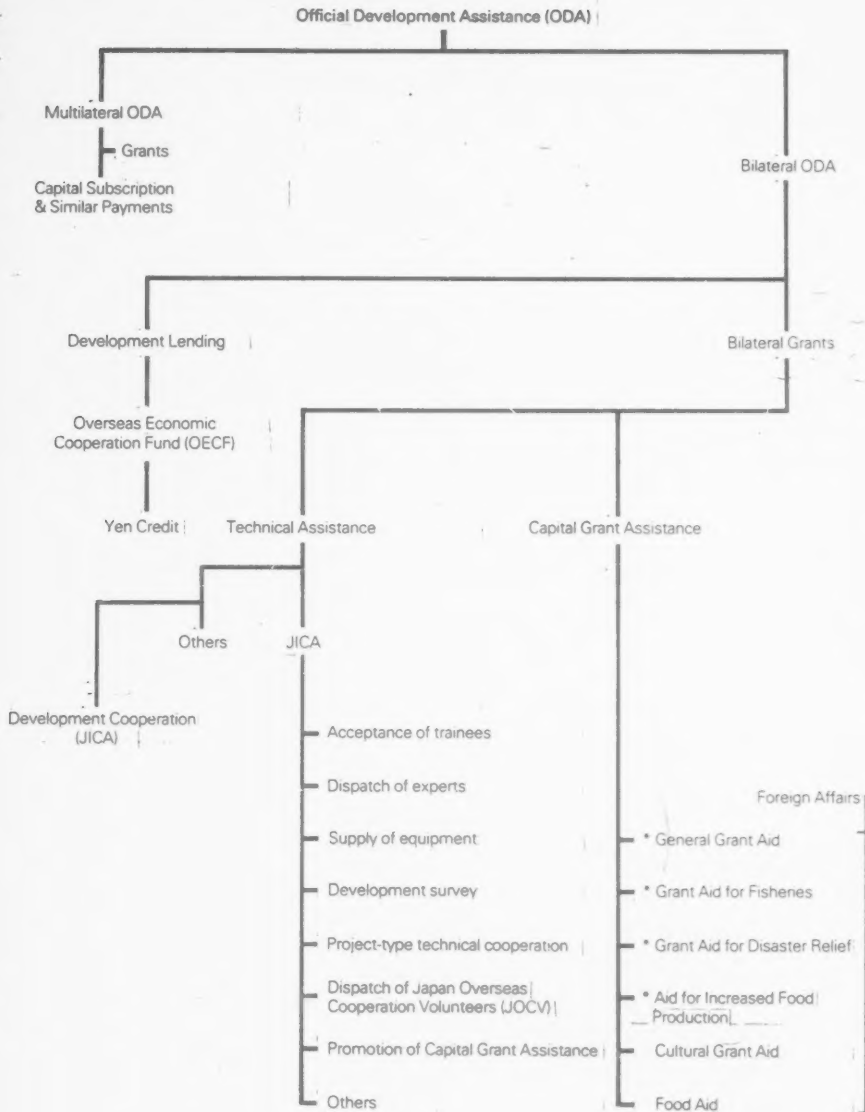
Unlike other countries, Japan does not have any experienced, centralized supervisory agencies which can deal with the co-ordination of the technical and political aspects of aid and development programmes. It simply does not have the equivalent of the French CCCE, the UK Overseas Development Agency or the Swedish International Development Agency (SIDA), all of which are able to deal with development programmes from the policy application stage, to project definition, to implementation and evaluation.

In Japan the structure for administering ODA is entirely different. If one excludes the multilateral aid system, and concentrates on bilateral aid, this can be divided into bilateral Grant Aid and Technical Co-operation on one side, and Loan Aid on the other (see Figure 28). Most of the Grant Aid is food aid or aid for increased food production. This consists mostly of food supplies for famine-stricken countries, and agricultural goods such as fertilizers, machinery and chemicals (APIC, 1987). Fisheries and cultural development are the only sectors which receive specific support. The responsibility for Grant Aid lies with the Ministry of Foreign Affairs, but JICA (see below) contributes to technical evaluation and support.

Technical Co-operation is largely the responsibility of JICA and is organized into five sectoral programmes (such as agriculture and forestry, and health and medical). JICA is supervised by three major ministries, namely, Foreign Affairs, MITI and the Ministry of Agriculture, Forestry and Fisheries (MAFF) (JICA, 1987a and 1987b). Project-type technical co-operation, ie planning the activities of experts, and integrating these with development surveys, equipment supply and the technical training of overseas trainees in Japan, and for a specific project, is one of the most important facets of technical co-operation.

JICA also provides financial assistance through the Development Co-operation Programme (and participates in the Grant Aid programme of the Foreign Affairs ministry (JICA, 1987c)). In relation to tropical commercial forestry, this has been

Figure 27: System of Japan's Official Development Assistance



particularly controversial during recent years. It is provided via the Development Co-operation Programme of the Foreign Affairs Ministry. (However, JICA participates in the Grant Aid Programme of the Foreign Affairs Ministry by contributing to the Fishery and Increase of Food Production Programmes, and through technical support, and liaison between recipient country and Japanese banks, private companies and consultants (JICA 1987c).) The Development Co-operation Programme

... aims to furnish funds in "soft" conditions and also surveys and technical instruction to those social, agricultural, forestry, mining and manufacturing development projects to be undertaken by Japan's private enterprises in the developing countries, and which will contribute to socio-economic development, improvement of the welfare of inhabitants, stabilization of people's livelihood, etc in the said countries, and which have difficulty in receiving a supply of funds from the Export-Import Bank of Japan and OECF (APIC, 1987).

Loan Aid, implemented by the OECF, is the other side of bilateral ODA. The OECF was created in 1961 to assist overseas investment by Japanese firms, and now provides concessionary loans to developing countries (OECF, 1986). It also provides loans and equity investments for Japanese corporations who are involved in investment projects in the Third World. Originally, Loan Aid was largely tied to purchases and contracts for Japanese companies. But since 1974, a growing number of loans have not been tied (at least officially). These loans are classified as aid, according to the rules of the DAC, because of their concessionary nature (lower interest rates depending on the type of project, long repayment periods, etc).

The last category of ODA is Multilateral Aid. This can take the form of grants and payments to international agencies (usually of the UN), or capital subscriptions and similar payments to international financial organizations such as the World Bank, and regional development banks. The impact of Japan's strong economy on these institutions is growing.

General Problems of Japanese ODA and its Effects on Tropical Environments

Japanese ODA has some serious problems. Their resolution is crucial to the future efficiency of the expanding aid programme. They include technical problems concerning management and evaluation. Others are of a more general policy nature, such as those relating to aid which is directly or indirectly "tied", or to the regional specialization of aid.

A third problem concerns the preferred types of programmes and projects. So far these have mainly been large industrial and infrastructure development programmes, which have had a negative impact on the environment and local populations.

Managerial Weaknesses

The administration of the Japanese ODA programme appears to be badly co-ordinated. Additionally, there are few channels for evaluation and direct responsibility for aid administration is lacking. Some figures indicate the extent of the problem. In 1976, when total Japanese ODA amounted to no more than US\$1 billion, 1,308 staff were working on it within the MFA, JICA and OECF. But in 1986, when total ODA had reached US\$5.6 billion, this number had only grown to 1,476. Compared to administrations in other countries each member of staff has an aid allocation of US\$3.82 million, as against US\$1.81 million in the US, US\$890,000 in the UK, US\$1.26 million in West Germany and US\$1.86 million in France.

Admittedly, the authorities recently increased the number of civil servants (6 more at JICA and 14 more at MFA, but this is hardly commensurate with the increase in ODA in financial terms (International Development Journal, 1988). The shortage of staff, and the heavy financial responsibilities borne by each existing member of staff, mean that workloads tend to focus on large projects rather than smaller, grassroots projects. This is partly because smaller projects entail just as much paperwork as larger ones. To make matters worse, there is a shortage of experienced development officers (for whom there are no specific training institutes). In a recent critical appraisal of ODA, the Asahi Evening News noted that:

Despite the government's insistence that the existing system provides the necessary expertise, it is widely felt that Japan is desperately in need of development assistance specialists. Because Japanese bureaucrats are usually rotated from section to section every four years, there are few development aid experts in the Japanese government (Armstrong, 1988).

The lack of programme management integration and the multiple administrative authorities, who in effect fragment the policy making framework, are further aspects of the same bureaucratic problem. Furthermore, Japan does not have a general foreign or development aid Act. This makes it very difficult for the numerous administrations to co-ordinate their practices and decisions.

In principle, the Ministry of Foreign Affairs has a central policy co-ordinating role, and JICA and OECF each control the project appraisal and monitoring in their respective areas. But further complications arise because other ministries (especially MITI and MAFF, which officially

supervise JICA for subjects within their competence, which means virtually everything) have a large say in the choice of programmes and definition of projects. Finally, the Ministry of Finance controls the purse.

Programme appraisal, implementation monitoring and evaluation of completed projects are very weak as a result of these problems, and also because, for a long time, efficiency was not seen as a necessary component of aid. The ODA institutions themselves have recognized this:

Japan, being a latecomer in the area of aid, has fallen behind in the area of evaluation as well (APIC, 1987).

At the same time it was reported that:

This absence of development expertise is best illustrated by the poor quality of many Japanese project feasibility studies. According to a July 1987 report by the privately funded Japanese International Development Co-operation Study Group, "... decisions are frequently made on the basis of partial or even sketchy appraisals ... Basic development policies and sector priorities are inadequately analysed and assessed prior to approving individual projects" (Armstrong, 1988).

Some years ago the OECD criticized the insufficient appraisal and evaluation procedures of Japan's ODA. Evaluation procedures illustrate some of the weaknesses of current practices. During visits to JICA the authors of this report were impressed by the efforts being made by agency officers to improve the current situation. Steps have been taken to build an appraisal and evaluation strategy, largely based on the recommendations of international bodies such as the OECD's DAC. In 1981, an Evaluation Research Committee was set up within JICA to formulate evaluation guidelines, establish procedures and select projects or areas for evaluation. More recently, an Evaluation Section was created within the Ministry of Foreign Affairs, but it is not yet fully operating and firm guidelines are yet to be agreed at government level.

Two types of evaluation are carried out through JICA: "project evaluation", conducted at the end of each project and "cross-sectional evaluation", either at the level of recipient country (all projects within a country), or by theme. Some evaluations are carried out by independent experts, international organizations, or with the participation of recipient countries. Each of these exercises has specific functions and helps to relate implementation to original goals, apparent development needs, follow-up requirements, and so on. Eleven major criteria have been defined, ranging from "project sustainability" to "women in development" (JICA, 1988c). At this level the inadequacies of such an evaluation procedure appear clearly. There is no hierarchy of requirements and aims within the major evaluation criteria. Instead, several criteria are mixed up,

which in any evaluation framework, should be carefully separated, ordered and integrated according to an agreed aid policy and philosophy. As a result, criteria for policy and strategy aims are trivialized, and those for procedural and technical achievement confused. For instance, policy aims (development effects, women in development, environmental impact), project criteria (sustainability, integration with other co-operative projects, justifiability of follow-up), and efficiency criteria relating to JICA's own role (suitability of project planning, utilization of equipment supplied), etc., are all mixed up in a single list and ranked at the same level. Such an unstructured, unfocused set of criteria cannot offer any real prospects for independent evaluation.

The plethora of agencies making yearly general "evaluations" of aid programmes is yet another problem. MAFF, MITI, MFA and the Economic Planning Agency (EPA), all publish evaluation reports. These do not have a common policy or methodological framework and contain no independent element.

The Role of the Private Sector in ODA

The role played by the private sector, and more specifically by the large trading and contract engineering corporations, in the selection of projects and funding strategies, also creates problems for Japanese aid. Overseas Development Assistance was in effect born out of the Japanese government's support for the private sector's overseas activities. The frontiers between the two types of interests are often not clear. The OECF, which still distributes a sizeable proportion of ODA in loan form (46% in 1987) was created as an investment bank for Japanese overseas investments in the Third World. JICA itself was created only recently. Development Co-operation, one of its most important programmes, is directly tied to the activities of Japanese private companies.

For a long time most Grant Aid was tied to contracts being allocated to Japanese firms. The Japanese government now aims to increase the "untied" component in its overall ODA. (In 1985 this officially accounted for 68% of total ODA (MFA, 1987).) The reactions of overseas competitors in the Third World infrastructure engineering market, when confronted with the Japanese government's policy of calling on foreign firms to compete for aid project contracts, were interesting. For example, the UK Export Group for the Constructional Industries, which groups together most of the large engineering contractors, was very sceptical. In a recent report it declared:

It is well-known that the closer one gets to such aid, the more clearly bilateral and tied to Japanese contractors does it become (quoted in Montagnon, 1988).

The main point is not that the Japanese private sector participates in some form in ODA projects, but that a proportion of ODA is used to secure projects for the Japanese private sector. These projects are often initiated within the private sector itself. One of the reasons for this is that Japanese ODA focuses very much on large projects.

While a sizeable percentage of other donor nations' ODA budget goes towards small-scale, grass roots projects, Japanese ODA is almost entirely focused on infrastructure schemes: roads, railways, bridges, hospitals, industrial facilities and hydroelectric power projects. Because of this focus, many of the projects are designed and built by Japanese firms (Armstrong, 1988).

The experience of recent years has shown that projects funded by Japanese ODA (such as large dams) can have dramatic effects on the equilibrium of water systems and the health and economic welfare of local populations (Goldsmith & Hildyard, 1984-87). Japan has played a part in a number of these projects. Yet, the assessment of the environmental impact of Japanese aid programmes is not well developed. In the 1987 Japanese ODA Annual Report (Ministry of Foreign Affairs, 1988), there is not a single reference to the need for environmental impact assessment of aid projects.

The Need for Proper Environmental Impact Assessment

The lack of environmental policy guidelines is a major problem for Japanese aid project management. Public declarations concerning environmental impact assessments have little weight in this context. The development manual which JICA has used since 1980 does not address environmental problems adequately. Sector manuals on project appraisal and management are mostly concerned, in environmental terms, with quality control and pollution prevention – useful and necessary elements but which in no way constitute environmental impact assessment.

The tendency of many Japanese administrations is to reduce environmental questions to a list of technical, direct constraints. Yet the environmental impact of aid projects is highly complex. For instance, a large project, with apparently innocuous direct consequences, can modify the economic strategies and lifestyles of local communities, who will not have been fully consulted during the planning process, and who may be forced to adopt new practices for survival in the new environment. These practices may well be destructive. Local populations are then blamed for damaging the environment, when the real responsibility lies with central government, Japan's ODA administration and the contractor, a Japanese corporation which probably suggested the scheme in the first place.

The concept of Environmental Impact Assessment is not well understood in Japan. EIA was introduced around 1980, but only on a voluntary basis, and at the discretion of the engineering consultancy firms who undertake feasibility studies for ODA projects. JICA has set up a committee in order to analyse environmental issues in relation to aid projects. But EIA reports are still confidential, and the JICA committee has so far operated in a secretive and non-participatory way. However, from what can be inferred about the reports, the methodology employed is out of date.

Environmental assessment in Japan does not generally include assessment of alternatives and is considered primarily as a means for proposing environmental amelioration measures for projects that have already been decided upon (Tanaka, 1988).

However, if the recent JICA/OECD recommendations are accepted by the government, this situation could change for the better. But the problems concerning Japanese ODA are far from being resolved. The significant increase that is being made in ODA funding is welcomed, as are recent improvements in conditionality, coverage and policy framework. But current inadequacies of project selection, appraisal, monitoring and evaluation are such that it is difficult not to express concern about the potentially negative environmental impact that could result from the current ODA increase. This is particularly so when the activities of the Ministry of Construction as regards long-term overseas projects are taken into consideration. Last year, the ministry set up a promotional programme and working group on the so-called "super-projects" (such as the second Panama canal, the Kra Isthmus canal in Thailand, and the super-bridges between Java and Sumatra and between Morocco and Spain). Japanese engineering firms are very keen to work on similar projects. The Ministry of Construction claims that:

It is necessary to promote international co-operation in the construction industry, as it is conducive to building up the national framework of developing countries and their economic development and social stabilization, and to furthering development of the Japanese construction industry (Ministry of Construction, 1988).

4.2.2 The Impact of Japanese ODA on Tropical Forests

The proportion of Japanese ODA allocated to specific forestry projects is small. It is especially small when one considers how important tropical forests are to Japanese raw material imports. The level of funds specifically allocated to Third World forestry is, in proportion to GDP, the smallest among DAC members. In 1984, excluding the forestry budgets of multilateral funds, Japan allocated US\$13 million to Third World forestry, whereas Denmark (which has very few historical or economic links with tropical forests, and which imports little tropical timber) allocated US\$10 million (Pasca, 1988). In 1988, Japan's contribution was expected to rise to US\$26 million, but even so, this figure is only comparable to Switzerland's own bilateral forestry aid contribution of US\$25 million.

Tropical forests are more affected by other types of Japanese aid projects (for example large infrastructure projects) than forestry projects. Nevertheless, it is worth discussing forestry projects for two reasons. Firstly, they have been, and up to a point still are, a tool for intensive and destructive logging. Secondly, there are several Japanese ODA funded projects which could provide a model for future action in preserving tropical forest remnants and rehabilitating degraded forest environments.

Forest Development Projects

Forestry related aid projects are included in several ODA programmes. Some of these are contained within General Grant Aid Programmes, but a larger number come under JICA's Technical Co-operation Programmes (especially project co-operation, development co-operation, surveys, dispatch of experts and training of overseas students/technicians). Projects are described in Appendix D, which gives some idea of the scope and relatively small scale of these programmes.

The larger and potentially most important forest programmes are organized under Project-type Technical Co-operation Programmes. These projects integrate several types of aid tools at various stages of a complete scheme. JICA organizes the surveys and feasibility studies. Several of the projects benefit from funding under Grant Aid. Generally, several experts, dispatched by JICA, work on a project throughout its duration. Additionally, "counterparts" (local persons attached to the project) are trained in Japan. Equipment is supplied directly through JICA equipment support programmes.

These projects have been underway since 1976, when the first one, the Forest Development Project in the Pantabangan area of the Philippines was launched. Appendix D provides a full list of completed projects and those recently set up.

There are three types of project: logging, timber extraction and use, tropical forestry research and

training, and reforestation of degraded or deforested areas. The last category includes projects which integrate some element of social forestry such as those in Kenya and the Philippines. Since the early 1980s, most projects have fallen into the last two categories.

A second type of technical co-operation consists in "development surveys". These are carried out fairly frequently in relation to forestry. Between 1976 and 1986, there were 15 of these projects in 11 countries, including Indonesia, Ecuador, Fiji, and Tanzania. To begin with, most of these projects were concerned with forest inventories taken prior to logging. But their function has changed recently and they now tend to be used in the preparation of general forest management guidelines (JICA, 1987c).

Training overseas students in forestry techniques, in Japan, is a further type of technical co-operation. Between 1952 and 1985 a total of 997 trainees were accepted. The changes that have occurred over the years in the type of training given are interesting. Many group trainees before 1980 were trained in mechanization and general forestry (38% and 32% of the total respectively, with the remaining 30% being trained in reforestation). From 1981 to 1986, and as new needs emerged, the proportions changed considerably. Student numbers increased annually and 47% received reforestation training. This was more than the total number during the previous three decades (JICA, 1986).

4.2.3 Aid Policies and the Development of Timber Markets

Much of the Japanese aid programme originated in support programmes for Japanese firms abroad. The reparation and quasi-reparation programmes which followed the Second World War and involved countries which had been occupied by the Japanese military, were also a key element (Masuda, 1988). The Japanese government did not ask any questions about the use made of transferred funds by the recipient country.

The unique structure of Japanese ODA partly explains the ways in which aid programmes have been designed. These are often initiated by the private sector and the Japanese aid agency asks few questions about impact and evaluation.

This is particularly noticeable in relation to the Development Co-operation Programme. The programme is managed by JICA, with entrusted funds, and

aims to support the economic activities carried out in developing nations by the Japanese private sector, which cannot easily attain loans from the Export-Import Bank of Japan or the Overseas Economic Co-operation Fund (OECF). In other words, this system aims to provide Japanese private enterprises – whose activities are beneficial to the developing nations but which have a low profitability – with the necessary funds under favorable conditions. It also provides technical assistance. The attractive funding, so-called Development Loan and Investment, applies to the establishment of the infrastructure associated with the activities of the private enterprises which contribute to the regional development (infrastructure projects), and also to experimental activities such as development of agricultural, forestry, and mineral resources except for oil, gas and metals, the technical basis of which has not yet been established (pilot projects) (Masuda, 1988).

In principle, the system could be very useful for a whole range of activities, nurturing development in uncertain and fragile contexts. However, it can be quite dangerous in areas where the control and power of the private sector goes unchecked. This has often proved to be the case in the tropical forestry sector.

Many of the Japanese aid and forestry projects which have given cause for public concern during recent years are linked to the Development and Co-operation Programme. JATAN has made a preliminary analysis of specific projects funded through it and related to forestry (see Appendix D). Two points emerge. This programme has provided subsidies for the construction of logging roads in areas which were later exploited by Japanese companies. The official justification has been that local people want to use the roads. In many cases, this is far from the truth. Logging roads are cut where they are useful for loggers, not for local

people, and they are generally not maintained after logging finishes.

A striking example of how the Development Co-operation Programme is used, was exposed in 1987-88 in the Diet. It concerned the Limbang Company in Sarawak which had been given concessionary loans for logging roads. The construction of these roads was bitterly opposed by the Penan people. The roads have inflicted heavy environmental damage and jeopardized the livelihood of the Penan, for whom the forests have provided a home for thousands of years. It was revealed that Japanese officials and ministers were not briefed about how Japanese funds were to be used. They were probably fed with half-truths and propaganda by private interests. (For instance, a school for local people was said to have been built recently. It had in fact already been in existence for 20 years.)

Another example of aid subsidy being provided for constructing logging roads for the benefit of a Japanese company, is found in Papua New Guinea. In the Stettin Bay timber permit area, roads used by Nissho Iwai, a giant trading house which has a very large concession there, were subsidized by JICA (see Appendices C and D).

Part Three: Tropical Forests and the Japanese Tropical Timber Trade – What does the Future Hold?

Chapter Five: The Japanese Tropical Timber Trade and Forestry Aid – the International Context

Japan now has the opportunity to take an initiative in tropical forest conservation and management due to the considerable growth in Japanese Official Development Assistance (ODA), and the country's relatively new and enlarged role in the international arena. This is particularly relevant in relation to Southeast Asia, the centre of the international tropical timber trade, and an area where Japan plays a particularly important political and economic role.

In this report, an analysis has been made of the interaction between short-term trade policies based on the requirements of a specialized industry – plywood manufacturing – and the long-term impact of this trade on tropical moist forest environments. This report has also shown that the current practices of Japan's tropical timber trade have little future. **The resource base is fast diminishing, and competing demand will mean that Japan will find it more and more difficult to ensure a regular and cheap supply of high quality tropical logs.**

Japan will not find itself short of timber supplies however. There are large softwood resources around the Pacific Rim which could compensate for losses of tropical timber resources. On the other hand, if Japan continues its "business as usual" approach, ie allows tropical timber to disappear as a commodity before acting, the stability of the Southeast Asian region will probably suffer. Environmental degradation and destruction of the natural resource base can only exacerbate current social and political problems. Japan really has no alternative but to adopt new trade policies in relation to tropical forests. These should support long-term sustainability and local community development; they would have the benefit of allowing Japan to continue importing high-value tropical timber.

5.1 Japan's Role in the Field of International Co-operation on Tropical Forestry

The prevention of further degradation of tropical forests requires international co-operation in many fields, including those of research, trade, and support for community development programmes.

A number of international organizations to which Japan contributes are now active in these fields. The International Tropical Timber Organization (ITTO) is the one most concerned with tropical timber. A United Nations specialist organization, the ITTO represents the first commodity agreement to place significant emphasis on the link between the conservation of the resource base and the trade itself. Japan, which is host to the ITTO's headquarters, has been an active member, and could play a very positive role in contributing to the work of the organization.

Bilateral and multilateral aid agencies have liaised through the Tropical Forestry Action Plan (TFAP). This could become an important operational and financial tool for forest regeneration and protection programmes as long as it does not succumb to top-down planning procedures, and remembers that local communities are the main link with sustainable development.

So far Japan has been but a modest contributor to TFAP (TFAP is further discussed in Section 5.1.1). Other programmes are administered by FAO, UNEP, the World Bank, and regional institutions. Japan's economic power and increased involvement in issues of global concern should enable it to persuade these agencies to give more support to tropical forest management and conservation.

Box Eleven: International Trade Co-operation – What Future for the ITTO?

The International Tropical Timber Organization (ITTO) has several original features. It was created through the International Tropical Timber Agreement (ITTA), itself born out of the United Nations Conference on Trade and Development (UNCTAD) programme of International Commodities Agreements. The ITTA was signed in 1983 (UN, 1984) after long negotiations which had begun in 1977.

The formation of the ITTO required that a number of countries ratify the ITTA before 1985. Non-governmental organizations (NGOs) had to push hard to ensure that the quota of countries was reached. Finally, 41 countries became party to it. The key feature of the ITTO is described in its preamble and objectives, both of which link the survival of the trade to the survival of the resource base and its environment:

Recognizing the importance of, and the need for, proper and effective conservation and development of tropical timber forests with a view to ensuring their optimum utilization while maintaining the ecological balance of the regions concerned and of the biosphere (UN, 1984)

In Article 3, which lists the main objectives of the ITTA, point (b) makes conservation one of the objectives of the agreement:

To promote the development of national policies for sustainable utilization and conservation of tropical forests and their genetic resources, and to maintain the ecological balance of the regions concerned (1984)

The ITTO now has 42 member countries, including most of the tropical timber producers (but excluding some such as Burma, Zaire and Nigeria). Most consumer countries are also members, although some countries, for example, Israel and New Zealand, have not yet joined. The rules governing the ITTO contain interesting concepts, for instance concerning the equality of voting rights between producers and consumers, and the allocation of votes per producing country according to a combination of timber production volume and forest area.

Partly as a result of NGO pressure, the ITTO has now defined its central role as encouraging the sustainable utilization and conservation of tropical forests, and developing international forest management policy.

A number of interesting pilot projects in forest management have been initiated, and the status of forest management in all member states has been reviewed (Poore et al, 1988).

In principle, the ITTO could provide a forum for co-ordinating the development of an international trade based on sustainable forest management. This co-ordination is necessary, since if a single member state introduced sustainable management and therefore incurred higher costs during its timber production, it would place itself at a competitive disadvantage in relation to other producers.

However, the ITTO's activities do not reflect the scale of the problems facing tropical forests. As tropical forests disappear, and the international trade looks increasingly towards softwood supplies, it could easily find itself becoming irrelevant. As host to the ITTO, Japan should take an active role in ensuring that this does not happen.

5.1.1 Multilateral Efforts for the Protection of Tropical Forests

The Tropical Forestry Action Plan (TFAP) was prepared by FAO (FAO, 1986b) and adopted at the World Forestry Conference in Mexico in 1985. It was preceded by a "Call for Action" prepared by the World Resources Institute, the United Nations Development Programme (UNDP) and The World Bank (World Resources Institute, 1985).

The plan is based on the premise that tropical forests are being depleted because their contribution to national economies is undervalued, and that as a result of this, insufficient investment is made in the forestry sector. TFAP calls for a major increase in the aid funding allocated to the forestry sector, with a target of US\$5.3 billion for the period 1987-1991. The following areas were identified as priorities:

	% of Investment	Total (\$m)
Forestry in Land Use	17	916
Industrial Use	25	1316
Fuelwood and Agroforestry	30	1576
Conservation	8	448
Institutions	20	1064

The TFAP also aims to improve communication between the previously unco-ordinated bilateral and multilateral donors within the context of "Country Plans". These are developed in consultation with local partners, including NGOs.

The creation of the TFAP has resulted in an increase in aid funds to the forestry sector, although the full extent of this is not clear and may partly be a matter of presentation. Furthermore, the TFAP has been severely criticized by a number of NGOs for being a top-down process which involves neither local people nor NGOs (Renner, 1987). Its attention to environmental conservation also leaves something to be desired.

Preliminary results suggest that forestry aid will increase dramatically. But will aid be spent on ecosystem conservation and a holistic approach to forest management? It appears more likely that we will simply get more of the same: major investments in forest industries, plantation forestry and institution building. Threats to forests usually come from the activities of people who have no choice but to encroach upon forests to ensure their own survival. Therefore a lot of the TFAP money must be spent on ecologically sensitive agriculture and forestry, implemented by rural people. Forest conservation will only finally be achieved when people see it as their own interest (Sayer and Collins, 1987).

The recent regional TFAP for Latin America and the Caribbean does nothing to allay these concerns and only allocates 1.5% of expenditure to conservation (FAO, 1988b).

There are signs however that TFAP's participants wish to respond positively to some of this criticism and increase the level of consultation with local groups and conservation NGOs.

Up until now, Japan has been only moderately involved in the TFAP. It should consider contributing specific funds for conservation oriented projects which are defined and managed by local communities. The efficient use of funds for such projects is not achieved simply by handing out large sums for single prestige projects.

5.2 Japanese Development Aid: The Need to Reconcile Economic Efficiency with Environmental Sustainability

Japan should concentrate its ODA efforts on an environmentally oriented programme for tropical regions, which focuses on conservation and the sustainable development of forests.

In the 1970s, aid and development support programmes were largely centred on the concept of "basic needs". There is now growing awareness that such basic needs can only be satisfied if the environment is treated sustainably.

This bears directly on both timber trade practices and aid and development programmes.

5.2.1 The Selection of Projects: from Policy Choices to Impact Assessments

Some general considerations similar to those that have been developed by a number of bilateral and multilateral aid agencies, should be applied to all Japanese funded aid projects. Their implementation will require that Japanese ODA agencies employ a large number of technical specialists with Third World experience.

1. **Project Appraisal** – Full project appraisals should be carried out before even preliminary decisions on funding are made. Project appraisal missions, which include ecologists, sociologists and other relevant specialists, should visit the project area to assess the impact that the project may have, and consult local communities on all aspects of the project's design.
2. **Environmental Impact Assessment** – Full Environmental Impact Assessments (EIAs) should be carried out systematically. Current Japanese procedures and practices relating to EIAs are inadequate. Again, the assessment should provide opportunities for the purported beneficiaries (local people) to have a substantial input into the project. If necessary, mitigation measures should be included.

3. **Monitoring and Assessment** – As the project proceeds, regular monitoring should be carried out to ensure that it is producing the desired results, and to ascertain whether adjustments need to be made. An assessment of the success of the project should be made on completion, and follow-up activities, if necessary, identified.

4. **Debt Swaps** – Recently, there have been several examples of conservation NGOs purchasing discounted Third World debt on the secondary markets, and exchanging it for local currency earmarked for conservation projects. The Dutch government was recently involved in such a scheme in Costa Rica. There is ample opportunity for Japan to support appropriate debt swaps for conservation, and it would be able to do so on a much larger scale than conservation NGOs, whose means are usually severely limited. To avoid sensitive issues of national sovereignty, Japan's debt swaps should avoid land purchase, but support the creation of endowments to fund conservation activities.

5.2.2 Implementing Aid Programmes: the Forestry Angle

The following recommendations for forestry projects can be made. Many of these could be implemented in collaboration with conservation NGOs:

1. Most forestry related projects should not be forest-only projects. One of the lessons of the last three decades has been that projects can only work if they are integrated – ie link social concerns, agriculture, infrastructure and forestry – at a local level.
2. Forestry aid should concentrate on the specific fields in which Japan has experience (for instance agroforestry), and should be implemented according to existing sets of guidelines, such as those formulated by the International Union for Conservation of Nature and Natural Resources (IUCN) (Poore and Sayer, 1987), or the International Institute for Environment and Development (IIED) (Wyatt-Smith, 1987).
3. Multi-use management of tropical hardwood forests (HIID, 1988), linked with agroforestry in buffer zone areas, is probably the best means of "working" tropical forests without degrading or destroying them. Single use management (ie timber extraction) is to be avoided in most cases since it tends to exclude local people. Agroforestry and community forestry already have a wealth of experience behind them because they have been practised for a very long time. Their role in social development, environmental conservation and sustainable forestry is being increasingly recognized (Winterbottom and Hazlewood, 1987).

The multi faceted experience of agroforestry in Southeast Asia, rooted in history but still practised in many areas, is well-known. It can be found in countries as varied as Thailand, Burma (the "taungya" system), Indonesia (the "tumpangsari" system) and Japan (the "yakhata-ringyo" system) (Morita, 1986). International experience in community forestry is accumulating, partly through multilateral programmes such as those of the FAO and the Swedish International Development Agency, and through the Forestry for Local Community Development Programme (FAO, 1978, Arnold, 1987). Additionally, efforts to develop agro-forestry are being co-ordinated at an international level. (For instance through the ICRAF in Nairobi). Japan should support these efforts.

The problem for community forestry and agroforestry projects is that no matter how successful they are (and in many places they have been), they remain isolated and fragile at the socio-political level. There have also been difficulties in a number of cases. For example, "social forestry" has sometimes degenerated into industrial forestry. Eucalyptus plantations have on occasion been used to supply pulp mills, in effect annexing what was previously waste land, away from the local poor (Environmental Defense Fund, 1987). In many instances, careful planning of regional and national programmes, based on needs expressed by people, is required in order to create a threshold above which self-development becomes possible. Japan could be involved in the organization and funding of such programmes.

4. Plantation projects should be supported only if they are situated on degraded lands. Obviously, care must be taken to clarify who the real beneficiaries of such plantations are, and ensure that methods do not deprive poorer members of the population of that which they previously obtained from natural forests "for free".

5.2.3 Training Japanese Experts: Learning from Tropical Forest Communities

Japanese experts are sent all over the world to instruct local populations in the use of various technologies. Yet these experts themselves need to learn, and in particular about tropical environments and forest management.

The lack of trained Japanese people, especially in the fields of tropical forest management and ecology, has already been mentioned. The problem could be partly resolved through the development of training in Japan. This would require special programmes in higher and university education, as well as the creation of training programmes concerning the tropical environment in general. However, this would still not be sufficient. Training for administrators of those ministries which are responsible for aid is also needed. Administrators should receive training in the field, and learn about the relevant countries from the inhabitants themselves.

Chapter Six: Re-examining Tropical Timber Trade Policies

The extent of the degradation of Southeast Asian forests threatens to bring the tropical timber trade to a halt in many areas. If recent events in Thailand and the Philippines serve as any indication of future trends for other parts of the region, there is cause for serious concern.

The Japanese tropical timber trade must expect changes. In fact some, such as the new mass imports of Indonesian plywood into Japan, have already been forced upon it by international events. Further changes will arise as a result of increasing competition between Japan and other countries for tropical timber resources which are expected to decrease in both volume and quality.

However, these trends do not signal a shortage of timber supplies for Japan. Alternative sources of processed and unprocessed timber exist all around the Pacific Rim. **The most significant potential problem for Japan is that its plywood processing industry will have to switch to softwood supply.**

This chapter examines the ways in which Japan's timber trade and industrial policies could facilitate a transition towards sustainable commercial forestry in tropical areas.

6.1 Adapting Commercial Policies to the Realities of the 1990s

The Japanese tropical timber trade is currently bracing itself for change. Three significant events occurred in 1987 and 1988:

- the last in a series of reductions in duties on imported plywood and the resultant increase in Indonesian plywood imports;
- bans in the Philippines, and most recently, Thailand, on hardwood log exports;
- one of Japan's largest plywood manufacturers started to import softwood from the USSR and the US.

In order to ascertain the impact of these developments on timber imports, we will examine the Japanese government's latest projections concerning the consumption and supply of timber products in Japan. Like all projections, they are only as good as the assumptions upon which they are based. It is these assumptions that interest us, as they represent a consensus within the administration as to what the future holds.

6.1.1 Government Long-term Forestry Plans and Wood Industry Short-term Commercial Horizons: False Expectations and Real problems

Government Projections and Forestry Plans

The Japanese government's most recent government forestry sector policy paper was published in July 1987. The "Basic Plan for Japan's Forestry Resources" (MAFF, 1987) analyses Japan's own forest resources and their socio-economic functions. It also establishes a framework for delineating the long-term policy of the Forestry Agency, local authorities and private forest owners.

The 1987 Basic Plan is accompanied by a "Long-term Demand and Supply Projection for Important Forestry Products". This is based on a model of the wood economy which had to be profoundly modified when the model's built-in assumptions and relationships - developed for the period of "high growth" in the 1960s - had to be adapted for the period of so-called "stable growth", which occurred after 1973. Despite the adaptation, the timber trade does not consider the results of the projections to be totally reliable. However, they are still relevant, because they represent the only attempt to achieve consensus within the administration and economic leadership in Japan.

Box Twelve: Modelling the Japanese Wood Economy

The projections are established by using a supply model and a demand model. The two models are linked through a market pricing sub-model, which balances supply and demand through an iterative process.

The demand model is a straight economic model. It uses exogenous macro-economic variables (deflated rate of GDP growth, overall population growth, number of housing starts, etc) and various other behavioural and processing/use variables to estimate, through demand functions, the demand for specific groups of timber products (Forestry Agency, 1987d; Nomura, 1983).

The supply model is more complex. It is divided into several sectoral supply sub-models: one for imports (see below), and three for domestic timber supply. As discussed in Chapter 1, there are considerable variations in the management systems for Japan's 25.3 million ha of forests. These depend on the type of ownership, management and forest in each case. Consequently there are different models for different types of ownership (Amano et al., 1985).

This model also concerns imports. Some attempts to model the market behaviour of importers operating largely in an oligopolistic market have been made (Yukutake, 1982). However, in official projections, future overseas supply is simply estimated through qualitative evaluation.

The authors of the projections are clearly aware of the limits of current models:

The basis for the estimates in the supply model, such as the resource composition and type of logging, and those of the demand model, such as the volume of demand by wood product and data concerning the age of trees, are in many instances incomplete data. For this reason, the model is necessarily macro in nature and limited in accuracy (Forestry Agency, 1987d).

Figure 28 presents the long-term projections for supply and demand, which were published together with the 1973, 1980 and 1987 Basic Plans. This comparison shows how much expectations concerning future demand and supply have changed in 15 years.

For instance, the 1973 projection for total demand in 1981 was 134.8 million m^3 . But because of the economic crisis it only reached 93.7 million m^3 . The 1980 projections for total demand in 1986 were 118.4 million m^3 , when it actually only amounted to 95.0 million m^3 . These exaggerated projections are not surprising if we consider that all these forecasts depend on GDP growth trends, and that in 1973 wildly positive expectations pushed up timber demand forecasts considerably. In 1980, it was thought that Japan had weathered the worst of the crisis, and expectations that a significant growth in demand would occur were high.

The 1987 projections are more sober than the previous sets, but they still forecast that demand will continue to increase until the early part of the next century. It is anticipated that domestic supplies of just over 40 million m^3 will be available by the 1990s (partly because the plantations of the 1950s and early 1960s will have reached maturity by then). As a result imports are expected to remain stable at under 60 million m^3 (in previous projections imports were expected to reach 75 million m^3). This excludes plywood imports however. These are still expected to increase.

Expectations Concerning Imports of Tropical Hardwood and Substitutes

Detailed quantitative and qualitative assumptions concerning imports of timber products by country of origin for 1994 and 2004, which have been used for adjusting the supply projections of the 1987 Basic Plan, have been published (Forestry

Agency, 1987d). The basic assumption of the Japanese administration is that a "business as usual" scenario will remain valid in relation to tropical timber imports.

Some of the assumptions are unrealistic, such as the projected import of 0.5 million m^3 of Philippine logs in 1994, when it seems likely that there will not be any Philippine logs available by that date. Other assumptions seem more realistic – for instance, it is accepted in the same government document that imports of Indonesian plywood could reach 1 million m^3 in 1994. (Only a few years ago, it would have been political and commercial anathema to make such a claim.)

The overall impression given by this document is that the situation of the three main tropical log suppliers (Sabah, Sarawak and Papua New Guinea) will remain more or less unchanged, with some movement towards exporting sawnwood made by both Sabah and Papua New Guinea, and some plywood exported by Sabah.

6.1.2 Current Prospects for Commercial Forestry in Southeast Asia and other Tropical Regions

A number of warnings concerning the future of their commercial timber activities have been made recently by producer countries in Southeast Asia. Several countries, which some years ago were significant exporters, now either barely manage to cover their own domestic demand, or have become net importers.

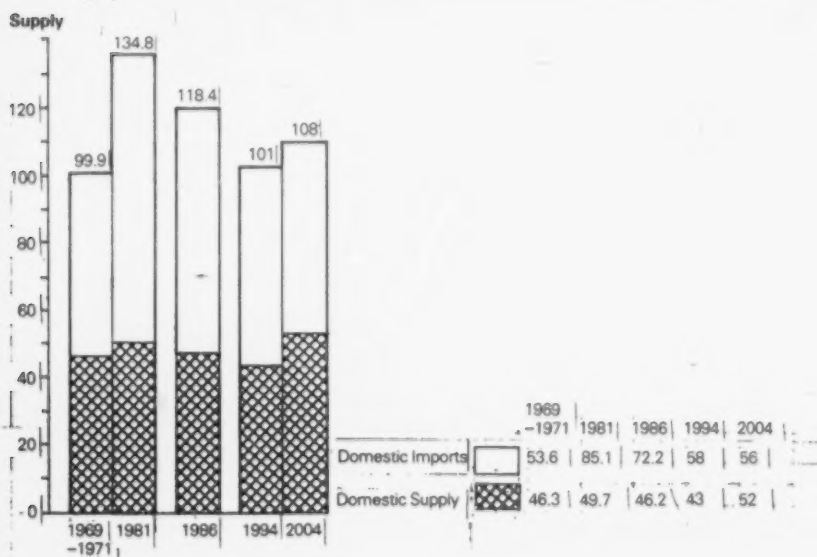
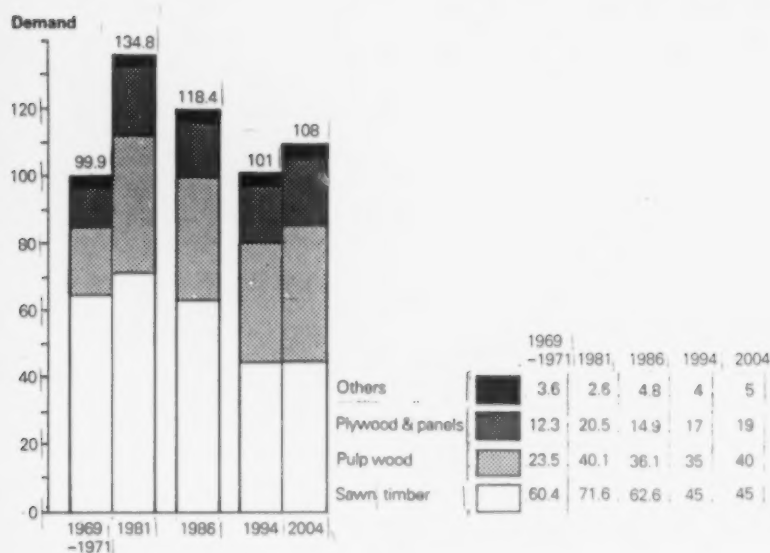
Thailand is a typical example. In 1974 it exported US\$37 million of forest products (FAO, 1987), and imported US\$54 million. Its deficit amounted to 21.5% of imports. In 1986, exports had reached US\$74 million, but imports had grown to a staggering US\$244.3 million (FAO, 1988). This was equivalent to a 70% import deficit. **The recent ban on logging will exacerbate this situation, and increase Thailand's dependency on neighbouring countries.**

Nigeria, one of the main tropical timber importers of the 1960s provides another similar example. In 1986 it exported a mere US\$6 million of timber products, but imported US\$177 million's worth.

Nobody is suggesting that forests in Southeast Asia or Africa will suddenly disappear. The most likely scenario is one of accelerated degradation in the most penetrable regions, leading to the fragmentation of forest cover into a "mosaic", which in turn will be further degraded.

Under such conditions the export capacity disappears first, although this can take time, as illustrated by the example of Côte d'Ivoire in West Africa. (Despite an 80% reduction since the 1950s in closed forest area, the Côte d'Ivoire was still annually exporting 1 million m^3 of logs in 1986. However, this is only a third of the export figure of a decade ago (3.3 million m^3 a year).)

Figure 28: The Uncertain Future: Forecasts on Japan's Supply and Demand in Forestry Products
(All volumes in million m³)



Note: 1969-1971 and 1981 projections made in 1973; 1986 projection made in 1980; 1994 and 2004 projections made in 1987.

The Philippines has tried to reduce exports but as one observer noted

Only 10 years are given as the remaining viable economic life of the Philippines' timber trade by both government estimates and the private sector. Extensions beyond 2000 are doubtful ... These findings are based on current findings of satellite surveys and ground sampling conducted since 1986 (Timber Trade Journal, 1988)

In the Philippines, official estimates of forest cover, standing stock volumes and deforestation are generally uncertain. The rate of deforestation in the Philippines has been variously put at 204,000ha/year (Development Academy), 380,000ha/year (Ministry of Natural Resources) and 40,000ha/year (Bureau of Forestry Development), (World Wood, 1986). It has been estimated that between 1974 and 1988, losses of Dipterocarp forest, as a result of shifting and permanent agriculture following logging, reached 186,000ha/year (Burgess, 1988).

Despite an improvement in forest management control since 1986, it appears that destruction and degradation still occur in many areas. In most cases, the pressure of landless farmers invading logged-over forests is directly responsible. But cases of speculative logging operations are still emerging. For instance, a series of reports recently made a damning assessment of logging practices in the island of Palawan, where concessions held by people benefitting from political patronage are grossly over-logged (Clad and Vitug, 1988).

The pressure to satisfy the increasing demand of domestic and non-domestic markets is strong. There are two types of market: domestic demand in producing countries, and domestic demand in other non-producing Asian countries. The populations of the producing countries themselves will have increasing needs, and in addition producing countries will consume more of their own raw materials, since they will be undertaking more processing work and exporting manufactured products such as panels.

There is little doubt that countries such as China, Singapore, Thailand and the Philippines will increase their levels of imports, especially from Malaysia. (The Philippines already has an agreement with Sabah concerning timber imports).

FAO has estimated that consumption of industrial roundwood in Malaysia could increase from 15.1 million m³ (in 1984) to between 20.6 and 26.7 million m³ in 2000 (FAO, 1986). It is unlikely that logging volumes will rise above the current 38-40 million m³. This means that fewer logs will be available for export. These figures have an indicative value only, and are based on econometric growth assumptions which do not take account of the increasing constraints which will be placed on the resource base due to forest degradation and deforestation. But they do show

the extent to which trade circuits will change over the next 15 years, and the likelihood that few logs will be available for Japan.

The Japanese timber trade is therefore starting to look for new sources of log imports – both temperate and tropical.

6.1.3 A Look Around the Pacific Rim and Beyond: from One Problem to Another?

Japanese log imports from the USSR, Canada and the US are likely to increase significantly over the next 15 years. Japanese plywood manufacturers will also attempt to obtain timber from Brazil – they have actually already started importing logs from Brazil.

There are expectations in the world timber trade that imports from the temperate shores of the Pacific will increase. As discussed in chapter 1, a large proportion of Japanese log imports come from the three countries of the North Pacific Rim. Since the 1970s the large timber corporations of the Pacific Northwest – in particular Weyerhaeuser, the world's largest timber company – have been developing long-term marketing strategies aimed at Japan.

It is easy to understand why. The economic growth potential for timber consumption is far higher in Asia than in North America. Furthermore, the Pacific Northwest companies have been experiencing difficulties at home. West Coast suppliers have lost out in the East Coast market, which is the most important in the US, to large Eastern producers whose timber is more competitively priced (Kato, 1986). In addition, the US market has been deeply depressed because of the general economic crisis of the early 1980s. At the end of 1982 in some parts of the Pacific Northwest, stumpage prices of Douglas fir stood at only 23% of their 1980 levels (Bingham, 1984). They soon recovered, but such variations dictated a spread of exports to overseas markets.

The strategy of large US companies – such as Weyerhaeuser – which have both an extraction and processing base, has been to look at the Eastern Pacific region for future long-term markets. They are now adapting very quickly to the specific requirements and standards of Japanese end-uses.

Both MacMillan Bloedel (from Canada) and Weyerhaeuser have built plywood processing lines to produce Japanese standard dimensions. According to Japanese analysts, Weyerhaeuser has a quasi-monopoly in US supplies to Japan, which means that it can dictate softwood prices (Kato, 1987). As has already been stated, this company also has a contract for supplying softwood logs to the largest plywood manufacturer in Japan. This is likely to be the start of a new trend. Weyerhaeuser, although it pays particular attention to Japan, is

nevertheless adopting a marketing strategy which covers the whole of the Far East. It was the first timber company to open a sales office in Beijing, China and also has sales offices in Hong Kong, Seoul, and Tokyo, where it is listed on the stock exchange and has traded for a quarter of a century.

What about Canada and the USSR? These countries have considerable acreages of softwood timber forests, and are already significant suppliers to Japan. But climatic and management conditions present difficulties in both countries. The cold climate reduces annual growth per hectare to less than half the US average, and both countries have a seasonal pattern of logging and maintenance. Furthermore, in both countries, forests are not managed in accordance with high productivity, long-term principles.

For instance, in Canada, forests in British Columbia are mined and degraded rather than sustainably managed.

Some 40% of the total Canadian ownership is in federal government hands, but that is concentrated in the Yukon and North West territories, far from economic availability. The remaining 50%, which includes the most important producing areas, is owned by the provinces, most of which historically have utilized them for current revenue and short-term industrial and economic development, rather than managing them for optimum long-term returns (Bingham, 1984).

In Siberia and Sakhalin, the transport problem and lack of efficient management are reducing the prospects of economic efficiency for large forestry operations. However, this can be expected to change. The establishment of joint-ventures between Japanese industries and forest authorities in the USSR could contribute to progress in this field.

The USA, Canada and the USSR are the three countries which have the greatest potential for supplying Japan with an alternative to tropical hardwood as a raw material. Japan also imports softwood logs from Chile and New Zealand. However, these have a limited range of end-uses in Japan.

Other wood-exporting countries and regions which could play a role in replacing Southeast Asian tropical supplies for Japan include Australia, West Africa and Brazil. Australia has become an important chips and pulp producer, due to its extensive eucalyptus plantations and it can be expected that these pulp exports to Japan will continue to increase. Increasing the level of imports of hardwood timber from regions other than Southeast Asia is a favoured Japanese option. West Africa and Brazil are the two main possibilities. Gabon and the Congo, where the majority of okoume stands are found, are the most interesting African countries as far as Japan is concerned.

Box Thirteen: Logging Problems in North America

There are however two problems which have to be addressed. These relate to the type of wood being grown in various areas and the environmental problems that could arise in alternative supply countries such as Canada.

In British Columbia, home to the last remnants of temperate rainforest, there is already clear evidence of overlogging. "Tree Farm Licences" with very low stumpage fees (amounting to perpetual leases) are allocated without impact assessments or public hearings to giant timber corporations such as MacMillan Bloedel, or BC Forest Products (now merged with Fletcher Challenge Canada, a subsidiary of the New Zealand group). Even Provincial Parks are not exempt from this type of threat.

Timber extracted in this province increased from around 55 million m³ in 1970, to 89 million m³ in 1987 (equivalent to at least 100 million felled m³). According to the Sierra Club:

... the long run sustained yield for the province, as best as can be determined from Forest Service figures, is around 55 million m³. That means that the current rate of logging in BC is roughly twice what the forest can sustain over the long run. You could even say that the forest industry is logging itself to death (Sierra Club of West Canada, 1988).

Recently, various local protest groups have been formed and a number of law suits filed, particularly by Indian communities and environmentalists. Some cases have been won (for instance the creation of a protected national park in the area of Port Moresby was achieved after civil disobedience by the Haida Indians). Others have been lost. But it is unlikely that the opposition will wither away.

Interestingly, protestors have used the same tactics as those used to prevent logging in Sarawak and the Philippines. In 1988, on Vancouver Island, logging roads were blockaded near Clayoquot Sound. Other areas of the island had been badly over-logged for years (Daniel, 1988).

In the US, environmental protests against the exploitation of "old growth" forest areas have been concentrated in states such as Oregon and Idaho (Wilderness, 1988).

In Alaska, protests have been made against the exploitation of two thirds of the Tongass National Forests by two companies which have benefitted from uniquely favourable financial and practical conditions. These two companies, the Alaska Pulp Company, owned by Japan, and the Louisiana Pacific/Ketchikan, have received 50-year contracts, with all logging roads built and paid for by the Forest Service (Beach, 1986). They pay a stumpage fee of only US\$2

per thousand board feet. This is 10–100 times less than fees paid by other contractors (Southeast Alaska Conservation Council, 1988). Most of the extracted logs are milled into pulp, mainly for export to Japan.

If the capacity to increase exports to Japan does exist in the USA, it is important to ensure that these imports will not be the source of environmental conflicts. If this is not done, long-term security of supply will not be guaranteed.

As noted in chapter 1, Japan started to import hardwood logs from Brazil in 1988. These imports are justified by the Brazilian authorities on the basis that they originate from areas soon to be flooded by dams, which would therefore be logged anyway. Japanese plywood manufacturers welcomed these first shipments with enthusiasm.

According to the Japanese timber trade's daily paper (quoted in Chapter 1), importers consider that Brazil could be a lever against Sabah and Sarawak in the trade game. This indicates not only that Japanese importers are hoping for a relaxation of the Brazilian log export ban, but also that they are considering only short-term marketing strategies.

6.2 Prospects for Japanese Commercial Forestry: Will the Production Base Change?

6.2.1. The Multiple Roles of Japanese Forests

Surveys of Japanese public opinion on the role of Japanese forests indicate that they are generally seen as crucial to environmental protection (Kumasaki, 1988). According to a 1986 survey, 70% of Japanese expect forests to prevent natural disasters, 49% to retain water, 36% to filter pollution, and only 33% to provide timber. Indeed, the zoning system of Japanese forests places considerable emphasis on environmental functions, such as watershed protection and flood prevention. A second category concerns recreation and wildlife protection.

This zoning system uses the concepts of "protection forests" and "natural forests" (Japan has 12.7 million ha of the former and 4.2 million ha of the latter, out of a total 25.3 million ha of forest.) These group national, quasi-national and prefectural forests at different levels of protection status. The remaining forest comprises private or public forest (see Figure 29). The problems of the private sector forests are briefly described below.

6.2.2 Costs and Competitiveness: the Relation Between Imports and Domestic Products

Forestry authorities expect that there will be a significant increase in Japanese domestic log production in the 1990s. This is because a large proportion of the plantations of the 1950s and 1960s will by then have reached commercial maturity. However, this development will only take place under appropriate economic conditions. For instance, the price of imported timber products will need to increase to the extent whereby the logging of marginal Japanese forests becomes financially attractive. Forests will also need to have been properly maintained, otherwise the quality of the wood extracted from them (and on which the domestic timber price will depend) will not be high enough.

As noted previously, the Forestry Agency's long-term projections forecast an increase in annual domestic roundwood production, from 35 million m³ per year to between 40 and 43 million m³ by 1994 (MAFF, 1987). In recent years the trend has been towards a lower domestic supply. In 1986, domestic supply amounted to only 34 million m³ (Forestry Agency 1987a).

There is very little time left in which to reverse the current decline, and enable Forestry Agency projections to be met. The difficulties and constraints are considerable.

The behaviour of forest managers varies according to forest ownership. The small-scale owner is unlikely to undertake maintenance and thinning operations if there is not a clear incentive to do so. It is only when the costs of thinning have stabilized, or the market prices of logs have been increasing on a regular basis for a sufficiently long period, that they are prepared to involve themselves in such expense.

The amount of thinnings in softwood plantations has nevertheless increased significantly of late. According to the Forestry Agency the area thinned increased from 244,000ha in 1982 to 295,000ha in 1986 (Forestry Agency, 1988). However, this still represents only 1.1% of total forest area.

Labour costs were examined in Chapter 2. Various ways of resolving the dual problem of a dwindling and ageing rural population, and the low wages of forestry workers, have been attempted ever since the replantation periods of the 1950s and 1960s. A system of forest teams, working for groups of forestry owners, and thus reducing maintenance costs, has been organized, but this system is still insufficient in terms of improving the productivity of commercial forestry to a level whereby it would be competitive with low cost timber imports.

The Forestry Agency has allocated considerable funding for subsidizing hill forest management. 37% of the agency's budget is devoted to the general account (ie mostly private forests). In 1987, Yen 420 billion were spent on public works

Figure 30f Forests of Japan: Surface areas and national forests map



Forest land area and growing stock by ownership class (1986)

Ownership Class	Area (1000 ha)				Growing Stock (million m ³)		
	Total	Man-made Forest	Natural Forest	Others ⁽²⁾	Total	Conifer	Non-conifer
National	7,887	2,466	4,736	685	830	407	423
Public	2,684	1,152	1,421	108	280	168	113
Private	14,684	6,601	7,506	576	1,752	1,212	540
Total	25,255	10,218	13,666	1,369	2,862	1,786	1,076

Note: ¹⁾ Forests owned by local governments (prefecture, city, town and village)

²⁾ Unstocked woodland and bamboo forests.

(such as the prevention of landslides, floods and fires) and on direct help for private owners (logging roads, machinery, support for reforestation and maintenance) under this budget.

However, as we have seen, stumpage prices and maintenance costs are not likely to decrease. The proportion of thinnings which is simply left in the plantation stands is already considerable. In 1986, around 45% of an estimated 4.2 million m³ of thinnings was left in place, since the high cost of transport made it financially unattractive to extract it.

So although it seems likely that high quality domestic timber will continue to find a market, it is not certain that timber of lesser quality, usually harvested by clear-cutting methods and requiring costly replantation, will be competitive with imports. A great deal depends on whether or not US and USSR timber prices increase substantially on the Japanese market. The current high value of the yen makes this unlikely.

The future of many of Japan's forests may therefore lie in more sophisticated management, aimed either at multi-purpose use or production of high quality timber. The "1987 Basic Plan for Japan's Forestry Resources" partially recognized this issue. It prepared the ground for the development of "compound storied forests" where selective logging would be practised as a rule and various age classes co-exist. The "regeneration" of multiple use "natural" forests would allow for log production as well as the development of "recreational" resources. As far as the private sector is concerned, one expert has commented:

Many private forest owners are going to choose a less labour-intensive and more nature-oriented management system which is characterized by a long rotation period, high quality timber, selective cutting, stand improvement of natural forests, etc. Such a system may be ecologically sound and socially more acceptable than highly-mechanized and efficient monoculture forestry. However, whether it will be economically sound remains to be seen, and the line between the less labour-intensive management and the neglect of forest tending is very thin.

The problem is: who is going to take care of the forests when timber growing becomes unprofitable and the environmental values of forests increase? (Kumasaki, 1988).

A revision of the Forestry Agency's priorities could help to answer this question. It might be useful to delineate some regions where various experimental funding and technical support systems aimed at developing multiple use forestry could be analysed, and their efficiency and cost-effectiveness compared.

6.2.3 The Plywood Industry: from One Crisis to the Next?

As emphasized in an earlier chapter, the plywood industry underwent a recession in the early 1980s, with a number of companies either disappearing or suffering heavy financial losses. A restructuring plan, with financial support from the government, was then implemented. Since the end of 1987 – and now that the new consumer and construction boom is well underway – Japanese plywood manufacturers have been in an excellent position financially.

Nevertheless, a precarious future lies ahead for part of the industry. Some of the larger manufacturers (for instance those affiliated to the Seihoku Group or Daiken) are already restructuring or considering alternative strategies, but others could be in trouble because of competition from imported panel products, future changes in sources of supply or possible changes in construction methods.

One could say that the Japanese plywood industry should respond of its own accord. But there is a strong case for convincing the government of the need for a new support plan designed to facilitate the retooling or conversion of firms. This could probably only take place in the context of an industry-wide restructuring plan, partly aimed at switching to new raw material supplies and products.

Such a support programme could provide an opportunity to implement some of the policies outlined in the following section.

6.3 Adapting the Japanese Wood Economy to International Realities

Adapting the Japanese timber processing industry will involve switching to the most cost-effective and profitable sources of supply in the medium term, in order to get a return on investments. However, there is some reluctance to do this on the part of industries which for the past three decades have been the main users of tropical logs. In particular, they are waiting to see what effect the lower import duties and increase in number of overseas products to which the JAS standards are being applied, will have. Manufacturers are also keen to see the results of attempts made by industry leaders to produce and market softwood-based panels.

It is time to adopt a dual approach involving the selection of timbers according to end-use, and an increase in the level of "corporate social responsibility". As far as the tropical hardwood market is concerned, a number of possibilities require fuller exploration. These include:

- a code of conduct for importers and manufacturers, relating to the origin of imported tropical hardwood materials.

- a corporate fund, supplementing the government's contribution to the ITTO and other international bodies, for the support of projects relating to the sustainable use of tropical forest products;
- contributions from the corporate sector for the education of the general public, professional bodies, etc.;
- adapting the manufacture of products to more suitable end-uses; in other words, not using rarer high quality tropical hardwoods for short-term disposable end-uses which do not take the real value of tropical timber into account;
- "pricing up" quality tropical hardwoods, and switching to alternative materials whenever possible.

6.3.1 The Role of the Trade and Corporate Responsibility

Three types of company thrive on tropical timber extraction, trade and processing: trading houses, plywood and furniture manufacturers, and end-use operators such as construction companies. Their relationship with tropical forests is purely commercial, with tropical timber being sold and bought as a commodity. However, the industry is perfectly conscious that trade relations with tropical countries are now changing. The question is whether or not these companies wish this relationship to continue, albeit under changed circumstances.

One answer was given recently by the chief dealer of a large tropical timber importer:

Trees grow like weeds down there (in Southeast Asia), so they don't die out. If the supply is cut, traders will find them somewhere else – like Brazil (Asiaweek, 1988).

The concept of "corporate responsibility" is obviously relevant in the case of the tropical timber trade. There is no reason why corporations, and especially those which have benefitted from tropical hardwoods, should not contribute to conservation and sustainable management.

Several avenues can be explored, some of which have already been considered by business associations after having been proposed by environmental groups.

For example, it would be possible to raise a levy on all or some imports of tropical timber products. This levy could be paid by the importers, and then used to finance projects and programmes (through the ITTO, for instance) for the regeneration of tropical forests, the application of sustainable management systems, the development of local community based trade and so on. Such an idea was proposed in Europe by Friends of the Earth (Secrett, 1985; Nectoux and Dudley, 1985).

More recently it was proposed jointly by the UK Timber Trade Association and the Nederlandse Houtbond. These organizations group tropical timber traders in their respective countries at the level of the EC (TTA/NH, 1988). This idea is now being taken further by the Union pour le Commerce des Bois Tropicaux dans la CEE (UCBT), the EC-wide tropical timber trade confederation (Mallinson, 1988; UCBT press release of 15 February 1989).

According to the two European trade associations, a surcharge levied in Europe at the level of 3-5% of CIF (cost, insurance, freight) imports could yield between US\$50 million and US\$80 million, (using 1987 as a reference year). If such a surcharge was applied in Japan, it would probably yield similar amounts or more, depending on the structure and level deemed acceptable by the trade and the consumers. If for instance a 2.5% surcharge on CIF imports of tropical logs, sawnwood, pulp and plywood had been applied in 1986, this would have yielded some US\$50 million.

Box Fourteen: Codes of Conduct for the Timber Trade

In 1986, the European Commission (of the European Communities) published its draft 4th Environmental Action Programme, which included a section about environmental co-operation with developing countries.

In addition to Community participation in the ITTO, the draft identified other possible contributions which the EC could make to tropical forest protection efforts through better commercial forestry practices:

- a re-examination of the trade and aid policies of both the Community and the Member States from the standpoint of their impact on tropical forest conservation; and
- the promotion of a voluntary code of conduct among timber companies based in the Community to ensure that tropical hardwoods only come from concessions that include ecologically positive management policies. (Commission of the European Communities, 1986).

Later, there were other calls for a code of conduct. At ITTO meetings, NGOs proposed two project concepts – based on the idea of a code of conduct – to the Committee on Reforestation and Forest Management (Johnson et al., 1987). These developed proposals first launched by Friends of the Earth (Secrett, 1985).

The idea behind a code of conduct in consumer countries is that tropical timber products should be imported from environmentally sustainable sources. Just such a concept was taken up by the German Timber Importers' Federation (Verein Deutscher Holzeinfuhrhäuser - VDH) when it announced, in December 1988, that its members were to adopt a voluntary code of conduct. The West German code advocates that:

... tropical rainforests be exploited and managed only according to the principles of sustainability on the basis of the extensive practical and scientific experience gained in the course of the past 100 years in tropical forestry, ie that the substance of the forests including their species of flora and fauna be preserved and a sound equilibrium be established between ecology and economy (VDH, 1988).

Even more significantly, the VDH code commits those of its members involved in logging activities, to managing their concessions according to the principles of sustainability. It also offers political support for the development of processing capacity in producer countries, and offers cautious support for the idea of greater market transparency (one of the guiding principles of the ITTA).

The VDH code of conduct goes further than many NGOs might have believed possible of the timber trade federation of an importing country. It remains to be seen just how effective the code will be, and how easy it will be to monitor compliance by VDH members. There is no doubt, however, that the West German traders' code could serve as an excellent model for the Japanese timber trade.

There are three key problems with voluntary codes of conduct. Firstly, how will environmentally sustainable commercial forestry be defined? Secondly, how can one check the origin of a particular product? And thirdly, how could the problem of operating within a "free-trade" world, where such a code of practice could be seen as contravening GATT, be solved?

Definitions of environmental sustainability can be readily found (see for instance Elliott and Rose, 1986; Wyatt-Smith, 1987; Poore, 1988; and Appendix E). The trade may be less rigorous in its assessment of the effectiveness of sustainable forest management techniques, than environment or development NGOs. There is therefore a need to develop a means of independently checking the implementation of codes of conduct.

In relation to the second problem, the UK's experience, particularly that concerning the "Good Wood Guide" (Friends of the Earth, 1987), is interesting. The guide sought to identify retailers selling tropical timber from sustainably managed areas. Although it antagonized part of the timber trade, a number of local firms did agree with the concept, as did some major retail organizations (for instance, the furniture and houseware company Habitat).

Conflicts with GATT should not be exaggerated. A voluntary code of practice and surcharge could be seen as extra import costs, but they can be justified within the General Agreement on Tariffs and Trade itself. In article 20, GATT allows some exceptions to free trade rules provided that they do not "constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail". It is clearly possible to envisage such an exception for commercial forestry, especially since section (g) of this article refers to measures "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption".

A code of conduct for importers would therefore have two purposes. It would serve as a response to the real concern expressed by many people in consumer countries that international trade and economic relations are contributing to deforestation. It would also encourage commercial forestry operations in the producing countries to improve the conditions under which timber resources are exploited.

There is obviously little potential for an immediate switch to sustainable forest management. A transition period would be necessary for many reasons. For example, there is no market transparency in the tropical timber trade, and the origin of internationally traded timber products is often unknown. There is also practically no commercial forestry which is sustainable – perhaps 0.1% (Poore et al, 1988). And there is a need for agreement and co-ordination between producing countries.

But Japan should still consider some form of incentive to promote the import of timber from sustainably managed forests. Most industries are not necessarily adverse to self regulation – indeed they generally follow a code of conduct relating to specific problems in their area of activity such as grading standards, transport procedures, etc.

Consumer associations and trade associations (of users such as architects, quantity surveyors, carpenters, furniture makers and retailers) have a considerable role to play in raising the awareness of end-users. Once again, the European experience is relevant. In the UK, some architects' associations have recommended a code of practice, and lobbying by NGOs in West Germany, the Netherlands and the UK, has forced several local authorities to take a restrictive stance in relation to the use of tropical timber in construction.

It should also be noted that politicians in Europe are pressing ahead with measures to ensure that if voluntary codes are not implemented, then legislative changes concerning timber imports will be made. One such initiative has already passed through the Environment Committee of the European Parliament, in the form of a resolution by Hemmo Muntingh, the Dutch Member of the European Parliament (MEP). This proposed regulation calls for the EC to introduce a quota system for tropical hardwood and hardwood products. Eventually, imports would be restricted to those producer countries that were implementing, or attempting to implement national "Forest Management and Conservation Plans". Muntingh also proposes that producer countries receive financial support (up to 100% of the cost) to prepare the plans and acknowledges that:

... any restrictions on trade must be accompanied by a strengthened commitment to development aid, a greater flow of resources towards producer countries and a redoubled effort to promote international co-operation in forest management (Muntingh, 1988).

6.3.2 Modifying Consumer Behaviour, Informing End-users

Much tropical hardwood usage in Japan is wasteful. This is largely because of its low price (HIID, 1988). Increasing the efficiency of processing industries (ensuring that they use the most cost-effective type of material for each operation) and reducing waste, are problems that corporations and the Japanese government should address together. Policies should be developed in three distinct areas:

1. In the **construction** sector a number of products and activities do not require the use of tropical timber. They use it simply because it was "forced" onto the industry in the 1960s through a combination of low prices and promotion. The best example here is construction plywood (kon-pane and partition panels). In both cases, softwood plywoods can be used instead. Weyerhaeuser can produce resin-coated softwood panels which can be re-used up to 80 times, although in practice, re-use would probably be limited to a dozen times. However, this does show that the very high level of wastage could be limited.

If kon-pane wastage was reduced by only half (ie re-used six to eight times on average), tropical timber consumption would probably still be reduced by 10–15%. However, there are obviously problems in connection with re-using kon-pane, such as transport and storage of used materials. Alternative practices would therefore be preferable. For instance, the steel concrete frames, already used in heavy construction engineering, could be used more frequently.

A significant proportion of plywood is used for hidden panels (ceilings, partition walls, painted hollow doors). Lauan plywood could be replaced with softwood core ply or full softwood ply, with thin veneer on one face if necessary, particularly since most lauan plywood in Japan is purely utilitarian, and has little decorative purpose. Indeed, a sizeable proportion of plywood has a lauan core (either in strips or as veneer core) and a softwood veneer!

Ultimately, hardwoods should be costed in real terms. That is, the cost of managing the resource base sustainably should be taken into account. If high costs for the management of timber resources in Japan are acceptable, why should they be unacceptable for Japanese companies in the Philippines for instance? Philippine manogany, or DRM, are precious woods which take just as long to grow as Japan's best hinoki. It is highly unlikely that Japanese manufacturers would use hinoki for kon-panes.

Even if the aforementioned changes in the construction industry were made, a sizeable market consisting of high value products, for which no alternatives to tropical hardwoods

have yet been found, would remain. Additionally, they would command a higher price than hitherto.

2. In the **furniture** sector there is also a strong case for reducing wasteful uses of tropical hardwoods. Modern technology allows for flexible designs using non-wood materials and reconstituted wood panels which are solid and of high quality. "Throw-away" behaviour on the part of consumers must be discouraged.

Alternative materials, such as chipboard, particle board or softwood plywood, can replace high value hardwoods.

3. The Japanese use considerable quantities of **paper**, for which they try to secure raw material (Rodger, 1988). The wisdom of using mangrove and eucalyptus wood in the manufacturing of high-quality paper is highly questionable.

Mangroves are now threatened all over Asia. It is possible to organize the sustainable harvesting of mangroves, but this rarely takes place because logging operations are usually badly managed.

Eucalyptus plantations can be detrimental to local social and ecological systems. (The frequent resistance on the part of Indian farmers to plantation schemes is well-known.) Many more precautions should be taken when creating them.

An anti-wastage policy could be devised, enlisting the participation of paper-making companies.

Ultimately, the education and self-education of the consumer requires both government involvement and the support of all kinds of pressure groups, NGOs and consumer co-operatives. Consumer co-operatives are now flourishing in Japan.

6.4 Overall Conclusion

- The time is ripe for major changes in Japan's relation towards tropical forests. So far this relationship has been mainly destructive.
- The depletion of Southeast Asian forests, increasing environmental awareness in Japan, the Japanese government's recognition of its new role in the world, and technological developments, all favour this change. Japan has the resources and technology necessary to promote sustainable tropical forest management and conservation, initially in Southeast Asia and subsequently elsewhere. There is increasing recognition of this in some parts of the government.
- We recommend that the Japanese government, in co-operation with trade interests and conservation NGOs, develops a strategy for tropical forest conservation and management which deals both with global environmental concerns, and Japan's own timber needs. In our view, the main elements of the strategy should be as follows:
 - i) increased Japanese aid for the support of sustainable forest management and conservation,
 - ii) concentration of Japanese imports on sustainably produced timber,
 - iii) reduction of wasteful tropical timber usage in Japan and moves towards high value end-uses of timber for which a higher price is paid, and
 - iv) use of softwoods for general utility purposes for which tropical hardwoods are not necessary.

Part Four: Appendices

Appendix A: World Tropical Timber Trade Statistics**A Note on Roundwood Equivalent Volumes**

In this report, volumes of timber products have often been given in roundwood equivalent (RWE). This allows the aggregation of raw materials and processed goods in order to give a global figure for commodity utilization. RWE is a measure of the amount of (non-bark) timber used in the production of processed goods.

A problem arises however, owing to the difference in efficiency of processing roundwood between various countries. For instance, plywood mills of one country may require an average of 1.7m³ of roundwood to obtain 1m³ of plywood, whereas in another country, plywood mills may require 2.3m³ or more.

Because of the higher efficiency (less wastage) of Japanese processing capacity, compared with that in most of the Southeast Asian countries from which Japanese log imports originate, two different sets of conversion figures have been used for calculating the RWE volume of products. For Japanese domestic supply and demand data the figures used are those of the Japanese Forestry Agency, while for the other countries the coefficients are those established by the FAO Forestry Department and the UN Economic Commission for Europe (UN/ECE).

Figure A1 – Tropical Forests Around the World: 1980

Unit: million ha	World (76 countries)	Tropical America (23 countries)	Tropical Africa (37 countries)	Tropical Asia (16 countries)
Land surface	4814	1680	2190	945
All forests	1935	896	703	336
Closed forests	1201	679	217	306
(productive)	(886)	(522)	(163)	(201)
(unproductive)	(315)	(157)	(54)	(105)
Open forests	734	217	486	31
Coniferous forests	34	25	1	8
(productive)	(21)	(15)	-	(6)
(unproductive)	(13)	(10)	-	(3)
Hardwood forests	1900	871	701	228
Closed forests	1160	654	214	292
(incl. mangroves)	(15)	(6)	(3)	(6)
(productive)	(860)	(506)	(162)	(192)
(unproductive)	(300)	(147)	(53)	(100)
Open forests	734	217	486	31
Bamboo forests	6	?	1	5

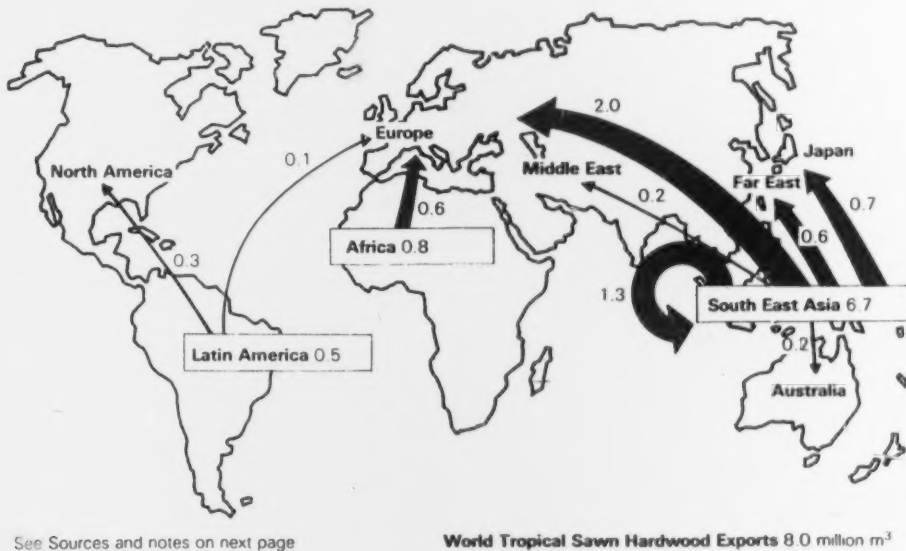
Source: **Lanly, 1982** – Surface areas are now thought to be far lower than the 1980 FAO estimates. Fallows are not included, nor bush formations.

Figure A2 – Forests in the Main Southeast Asian Timber Exporting Countries: 1986

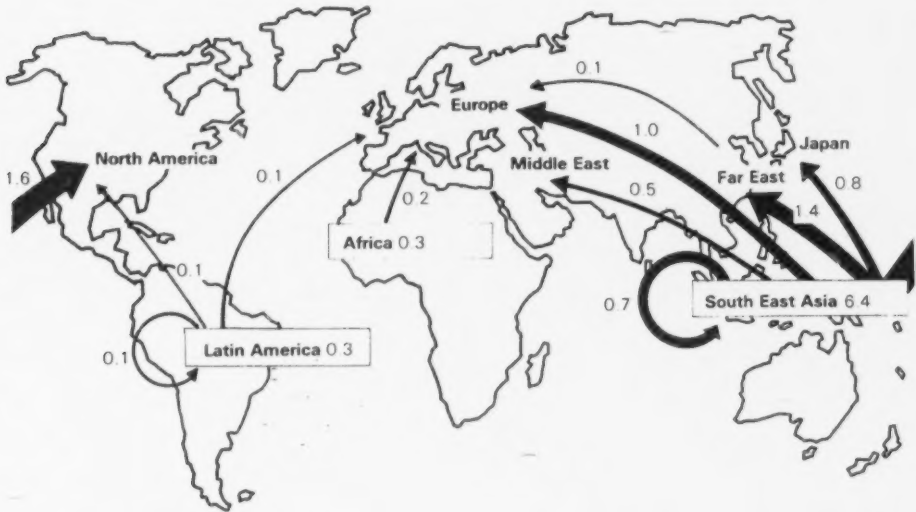
Unit: 1,000ha	Land Surface	Total Forest	Production Forest	Area under Concession
Malaysia	32,857	19,833	14,784	9,464
Peninsular	13,161	6,455	4,360	1,060
Sabah	7,371	4,485	3,406	2,004
Sarawak	12,325	8,893	7,018	6,400
Indonesia	193,071	143,971	64,404	53,374
Kalimantan	54,825	44,968		30,536
Sumatra	46,949	30,207		10,536
Irian Jaya	41,066	40,592		2,812
Others:				
Philippines	30,000	6,383	4,403	5,675*
Papua New Guinea	46,840	36,125	15,000	1,371

Source: Burgess, 1988

Notes: Such estimates are notoriously unreliable, for evident reasons. For instance, the Philippines concession area is greater than that of production forest(*). Production forest is closed forest which is not classified as a nature or national reserve, and which is potentially suitable for logging.

Figure A3a Tropical Log Trade Flows in 1986 – Hardwood (million m³)Figure A3b Tropical Sawnwood Trade Flows in 1986 – Hardwood (million m³)

See Sources and notes on next page

Figure 3c Tropical Plywood and Veneers Trade Flows in 1986 (million m^3)

Sources: FAO, 1988; ECE, 1988;

Total tropical plywood and veneers exports 7.0 million m^3

Notes: These maps present a simplified view of tropical timber trade flows, some flows are not shown, especially intra-regional ones

Far East region includes South Korea, China, Hong Kong, Taiwan, Macau. Singapore is included into South East Asia (which includes Pacific islands such as PNG and Solomon Islands)

Central America is included in Latin America (for which Paraguay, Chile and Argentina are excluded)

Figure A4 – The World's Main Tropical Hardwood Producer Nations: 1986

(Million m ³)	Roundwood	Fuelwood	Total
India	230.4	209.2	439.6
Brazil	163.9	125.0	188.9
China	138.9	103.6	242.5
Indonesia	156.5	128.9	285.4
Nigeria	90.4	82.5	172.9
Philippines	35.5	29.8	65.3
Ethiopia	35.0	33.3	68.3
Thailand	33.4	29.0	62.4
Bangladesh	27.8	27.0	54.8
Tanzania	22.9	21.5	44.4
Zaire	31.4	28.8	60.2
Vietnam	25.1	22.1	47.2
Kenya	20.2	19.3	39.5

Source: **FAO, 1988**

Figure A5 – The World's Main Tropical Hardwood Exporter Nations: 1986

(000s m ³)	Logs	Sawnwood	Plywood	Veneer
Malaysia	19159	2991	452	375
Indonesia	-	2160	4618	91
Papua New Guinea	1400	15	1	-
Philippines	352	495	256	50
Singapore	-	741	575	38
Solomon Islands	349	3	-	-
Côte d'Ivoire	1020	475	19	77
Cameroon	704	103	10	27
Liberia	358	6	-	2
Gabon	883	3	46	8
Congo	287	23	-	46
Brazil	9	375	218	50

Source: **FAO, 1988****Appendix B: Japanese Forestry and Wood Economy Statistics**

Figure B1 – Japanese Forests: Area and Growing Stocks

	1966	1971	1976	1981	1986
Forest Area (000ha)	25170	25220	25250	25280	25260
Total					
Artificial	7930	8860	9380	9900	10220
Natural	15510	14440	14440	13990	13670
Others	1730	1920	1450	1390	1370
Growing Stock (million m ³)					
Total	1887	2079	2186	2484	2862
Artificial	558	665	798	1054	1381
Natural & others	1329	1414	1388	1430	1502

Source: **Forestry Agency, in Kumasaki, 1988**

Figure B2 – Japanese Forest Ownership: 1985

(in thousands of hectares)	Total	Artificial	Natural	Unstocked	Bamboo
Total forest	25279	9895	13994	1246	144
National forest	7907	2396	4828	683	0
Public forest	2639	1100	1417	118	4
(prefecture)	(1143)	(440)	(653)	(50)	(0)
(municipalities and others)	(1496)	(660)	(764)	(68)	(4)
Private	14733	6399	7749	445	140

Source: Forestry Agency, 1986, Statistical Yearbook

Figure B3 – Recent Trends in Timber Volumes Extracted from Japanese Forests

Volume Extracted	1966	1971	1976	1981	1985
(000 m³)					
Total	73396	63192	44975	39498	42067
(National forests)	(23571)	(21459)	(15971)	(13971)	(13003)
(Public & private forests)	(49825)	(41733)	(29004)	(25527)	(29064)
including logs	51023	45253	35271	31370	32944
(coniferous)	(34918)	(26025)	(21388)	(20145)	(20558)
(broadleaved)	(16105)	(19228)	(13883)	(11225)	(12386)
Logged-over Areas (in thousands of hectares)					
Total	550.3	479.5	359.6	289.4	290.8
(National forests)	(163.1)	(149.1)	(121.8)	(100.2)	(107.5)
(Public & private forests)	(387.2)	(330.4)	(237.7)	(189.2)	(183.3)

Source: Handa, 1988. Up to 1972, excludes wood for chips. Final cutting only. Public forest is controlled by prefectures and municipalities.

Figure B4 – The Structure of Supply and Demand in the Japanese Timber Market (000m³ roundwood equivalent)

	1982	1983	1984	1985	1986
Total Demand	92933	93707	93963	95447	95447
Industrial roundwood	90157	91161	91361	92901	94506
Fuelwood & charcoal	924	610	614	572	481
Mushroom poles	1852	1936	1988	1974	1838
Industrial Roundwood	90157	91161	91361	92901	94506
Domestic	32154	32316	32874	33074	31613
Imported	58003	58845	58487	59827	62893
Sawnwood	47862	45990	44518	44539	44933
Domestic	19953	19392	18946	18814	18397
Imported	27909	26598	25572	25725	26536
Pulp and Chips	28279	30584	32433	32915	33558
Domestic	10633	11436	12470	12844	11878
Imported	17646	19148	19963	20071	21680
Plywood	10499	10849	10664	11217	10942
Domestic	443	442	457	433	404
Imported	10056	10407	10207	10784	10538
Others	3517	3738	3746	4230	5073
Domestic	1125	1066	1001	983	934
Imported	2392	2692	2745	3247	4139

Source: Forest Agency, White Paper on Forestry 1988

Figure B5 – Japanese Timber Imports: 1983-1987

	1983	1984	1985	1986	1987
Logs	29795	28404	28900	28929	32292
Total					
USA	7689	7200	7812	8334	9702
Canada	739	1193	1381	1433	1898
USSR	6406	5786	5565	6306	6125
New Zealand	313	306	294	260	389
Indonesia	2217	1466	202	-	-
Malaysia	10468	9764	11402	10788	12332
Philippines	706	1012	559	284	42
Others (1)	823	860	1083	1071	1142
Sawnwood	4667	4493	5176	5523	7397
Total					
USA	1425	1328	1398	1830	2404
Canada	2011	1938	2168	2094	2787
Others	1231	1227	1610	1598	2205
Chips	11402	12156	11812	12293	14026
Plywood (1000m ²)	5557	17507	44044	88055	237251

Source: Forestry Agency, 1988

(1) mostly Papua New Guinea and Solomon Islands

Figure B6 – Supply and Demand Balance in the Japanese Timber Market
(1,000m³ roundwood equivalent)

Year	Total		Other	Demand (Timber)		Supply (Timber)	
	Total	Timber		Domestic	Export	Domestic	Import
1955	65206	45278	19928	44105	1173	42794	2484
1960	71467	56547	14920	54778	1769	49006	7541
1965	76798	70530	6268	68943	1587	50375	20155
1970	105027	102679	2348	101577	1102	46241	56438
1973	121020	117581	3439	116894	687	42209	75372
1975	99303	96369	2934	95344	1025	34577	61792
1980	112211	108964	3247	108146	818	34557	74407
1985	95447	92901	2546	92469	432	33074	59827
1986	96885	94506	2379	94100	406	31613	62893

Source: Handa, 1988

Note: "Other" includes fuelwood, charcoal, log bedding for mushrooms (since 1970); up to 1959, includes waste wood on forest land.

Figure B7 – Japanese Log Imports from the South Seas Countries: 1970-1987
(Volumes in 1,000m³)

Year	Total	Philippines	Total	Malaysia			Total	Indonesia		Others	Others
				Sabah	Sarawak	Peninsular		Kalimantan	Sumatra		
1970	20238	7542	6020	3960	1872	188	6091	4931	797	363	585
1971	20259	5701	5750	4130	1472	148	8181	5916	1318	947	627
1972	21725	5136	6874	5409	1377	88	8977	6158	1710	1109	738
1973	26789	5896	8654	7309	1251	94	11231	8102	2109	1020	1008
1974	24208	3886	7981	6997	951	33	11450	7928	2433	1089	891
1975	17333	2853	6660	5958	702	0	7298	5386	1316	596	522
1976	22173	1692	10234	8490	1738	6	9656	7164	1611	881	591
1977	20947	1501	9628	8138	1487	3	9272	6801	1534	937	546
1978	21799	1559	10715	9212	1496	7	8986	7020	1108	858	539
1979	22083	1264	10468	8200	2268	0	9769	7039	1513	1217	582
1980	18955	1073	8580	6306	2260	14	8639	5438	1578	1623	663
1981	14728	1418	8388	5471	2917	0	4138	2427	623	1088	784
1982	15121	1308	10491	6442	4049	0	2453	1521	383	549	869
1983	13879	648	10313	6238	4075	0	2111	1516	192	403	807
1984	12943	935	9739	5483	4256	0	1328	735	177	416	941
1985	13001	510	11293	5892	5395	6	138	85	5	48	1061
1986	12131	264	10810	6019	4778	13	0	0	0	0	1056
1987	13688	27	12507	6980	5494	32	0	0	0	0	1154

Source: JPMA, Plywood Industry in Japan, 1987; and JTA, 1988.

Figure B8 – Trends in New Housing in Japan: 1965-1987
(in thousands of dwellings)

Year	Total New Housing	Wooden	Non-wooden	Owner/ Occupier	Rented Houses	Others (1)
1965	751	646	105			
1970	1485	1036	449	618	616	251
1975	1356	907	449	704	376	276
1980	1269	751	518	602	319	348
1981	1152	654	498	558	304	290
1982	1146	667	479	584	315	247
1983	1137	591	546	479	394	264
1984	1187	594	593	470	464	190
1985	1236	592	644	465	527	244
1986	1365	634	731	477	646	242
1987	1674	742	932	546	859	269

Source: Ministry of Construction, JPMA

(1) "Others" includes company houses, and houses built in lots for sale.

Appendix C: Japanese Overseas Interests and Joint Ventures in Tropical Timber Exploitation and Processing - a Selected List.

This appendix presents not an exhaustive list of Japanese timber interests in Southeast Asian countries, but a sample list of such interests showing the diversity and types of investments. They are listed by country.

Philippines

C Itoh: Aguinald Development Corp, established in 1967; a logging company. Also C Alcantara & Sons Inc, established in 1969; a logging company.

Gingoo Trade Co: Basei Lumber, established in 1967; a logging company

Noda Shoten Co: Pabios Enterprises Inc, established in 1960; a logging company

Mitsui: 30% of International Agroforestry Development established in 1980 (70% owned by Aras-Asan Timber Co Inc a logging company active in the Mindanao province of Surigao del Sur, and others), which manages a tree-farming project, near Quezon City. Aras-Asan Timber Co, formed in 1961, is controlled by Gingoo Trade.

Kawasaki Steel Corp: engaged in an integrated Giant Ipil-Ipil tree farm for the production of charcoal for smelters and also for the production of animal feeds, through 30% of Mahubay Agroforestry Corp established in 1978 with a capital of Pesos 8 million. Other Japanese corporations have minority interests (Kawasho Corp has 5%, as does Kawatetsu Bussan Co, a minor trading house)

Tokai Pulp Co Ltd: 40% of Safeway Products Inc (the rest held by Filipino investors) reforestation of tree farms and wood processing; established in 1974.

Eidai and Co: 40% of West Pacific Integrated Wood Inc; wood and lumber processing; also 15% of Tropical Philippines Wood Industries Inc, which produces plywood, lumber and blockboard, 15% also held by Toyo Menka Kaisha Ltd (Tomen), the trading house. Created in 1975.

Marubeni Corp: controls Great Pacific Timber and Development Corp established in 1984 in Zamboanga, which logs and produces sawnwood.

Mitsubishi Corp: 25.5% of Agusan Wood Industries Inc (formerly D.O. Plaza Enterprises) established in 1956; plywood production.

Nissho Iwai Co Ltd: has a share in Alson Co Inc, a company with a paper and pulp mill in Mindanao. Taio Paper Manuf Co Ltd also has a share.

Also in the Philippines, there are a significant number of smaller firms (either involved in logging and primary processing, or producing wood products such as chopsticks, rattan furniture and other handicrafts), in which a minority shareholding is held by Japanese individuals. Often, these Japanese established themselves in the 1950s and 1960s and worked with Filipinos to exploit concessions and serve the Japanese market. One example is Asian Timber Factors Inc, a logging and sawmilling company in which three Japanese people each hold each 2.5% of the stock. Another example is Rikko Wood Industries Inc which produces chopsticks; 54.5% of its shares are held by two Japanese businessmen.

Papua New Guinea

Some information on PNG was provided earlier (see Chapter 4) in this report. Other interests are listed below.

Nissho Iwai: Stettin Bay Lumber Co Pty Ltd, established in 1970 in West New Britain province. The construction of logging roads for this company was financially supported by JICA. It has several concessions in the Bagum and Kimbe area, and has started "reforestation" in Bagum with *Eucalyptus deglupta*. In 1986 it exported nearly 240,000m³ of logs, and 220,500m³ in 1987, 15% of all log exports from PNG during the latter year, mostly taun wood (PNG's major export variety), kamarere (the local name for *Eucalyptus deglupta*), malas, etc.

Otsuka Furniture: this company is one of the largest furniture manufacturers in Japan. It controls a joint venture, NIOD Pty Ltd, with the government. This venture was allocated a 20 year, 110,000ha concession on the island of New Ireland in 1977. Otsuka also controls a firm in Laos (Lao Wood Industry) which was established in 1974 and which logs and saws.

Sanyo Kokusaku Pulp Co: created Kaut Timber Co Pty Ltd in 1973, which produces logs and sawnwood.

Shin Asahigawa: Shin Asahigawa (PNG) Pty Ltd was established in 1973; it was recently alleged that this company had organized transfer pricing through Hong Kong. It is not a major direct exporter (7,600m³ of logs in 1987). It operates in the same area as Stettin Bay Lumber Company, in west New Britain.

Sohbu: Open Bay Timber Pty Ltd, established in 1971; the fourth largest log exporting company in PNG. It exported 85,600m³ of logs in 1987 and operates a 210,000ha concession in East New Britain.

Other Sohbu interests include Territory Development Pty Ltd, established in 1973, and Commonwealth New Guinea Timber Ltd. Both companies are involved only in logging.

Malaysia

C Itoh: owns 30% of Mados Itoh-Daiken Ltd, a joint subsidiary with Daiken, which controls 10%, owning a plywood mill in the Johore state in Peninsular Malaysia; this company has operated since 1969.

Until 1988, C Itoh also had a financial interest in Limbang Trading Sdn Bhd which exploits concessions in Sarawak for logs and veneers. Established in 1979, it is now "better known" for being one of the companies against which three indigenous tribes (the Penan, the Kelabit and the Kayan) staged protests in 1987, blockading logging roads and isolating logging camps in the northern parts of Sarawak, in the Limbang and Baram districts which surround Brunei. In Japan, a scandal erupted when it was revealed that JICA had financially supported the construction of logging roads in the area.

Oji Pulp: active in mangrove chipping through Jaya Chip Sdn Bhd in Sabah. Oji is also present in Johore with a forest plantation company established in 1971, Oji Malaysia Sdn Bhd.

Kanematsu: since 1971 has controlled Ipoh Lumber Products Sdn Bhd.

Kyoo: Sbatik Veneers Sdn Bhd, established 1969, produces veneers.

Kyoritsu: Makatio Sdn Bhd, established 1973; a logging company.

Kohjin: has two subsidiaries, one in Sarawak and one in Sabah, which produce chips from mangrove forests.

Shikko Shoji: has a subsidiary, Sharikat Berunteng, which chips old rubber wood discarded from plantations; established in 1972.

Sumitomo Shoji: this trading house controls the Ladalam Timber Complex in Sabah, which has produced sawnwood since 1973.

Daishowa: this multinational pulp and paper concern owns 60% of Daihowa (Malaysia) Wood Products Sdn Bhd which has used old rubber trees for chips since 1967; and SEA Afforestation Sdn Bhd which manages plantations; and Setia Jaya Wood Sdn Bhd which has existed since 1974.

Nissan Norin: Nissan Majulah (Sabah) Sdn Bhd, established 1973; extracts logs and produces lumber.

Nippi Boeki: Baram Sawmill Co Ltd has been processing timber since 1965.

Mitsui: controls 10% of United Industrial Paper Products Mfg Co Malaysia Ltd. This Kraft paper manufacture was established in Klang Selangor in 1966.

Mitsubishi: Pan Malaysia Industry since 1963 and 5% of Sentosa Plywood Bhd since 1965, both manufacture plywood in Johore.

Marubeni: since 1982 has controlled 25% of Capital Veneers Sdn Bhd, which produces veneers in Sabah.

Indonesia

Earlier in this report, we indicated that most Japanese interests in Indonesia had either closed down, or been sold to local partners, following the imposition of a number of restrictions by the Indonesian government. Nevertheless, and even if their importance has been considerably reduced since the early 1980s, there are still Japanese investment operations in the Indonesian forestry products sector.

It should be stressed that the control of forestry or processing operations does not always require the control of part of the equity. In Chapter 4 of this report the short description of the Bituni Bay woodchip project showed that Marubeni controlled the commodity through the funding of initial capital outlays and by disposing of the product on the regional market.

Examples of other investments include:

Sumitomo Forestry: this company controls 39% of P T Kutai Timber Indonesia, a plywood manufacturing firm. The rest of the capital is held by the well-known Indonesian group Astra International. The firm, based in Java, produces 300,000 sheets of plywood per month, for which it requires 50,000m³ of logs. 80% of the production is for export, including to Japan. The firm employs around 930 people.

C Itoh: this trading house controls 70% of P T Arut Bulik Timber Co, a logging and plywood manufacturing concern. Established in 1978 in Kalimantan, it employs 200 people.

Shin Asahigawa Co Ltd: owns 70% of P T Talwood Indonesia, established in 1973, and employs 110 people in a sawmill.

Kongodo Co Ltd: this furniture manufacturer based in Osaka owns 49% of P T Kongo Indonesia which employs more than 400 people in its Jawa Tengah plant.

Nanzai Shoji Co Ltd: this company controls 49% of Nanzai Plywood Industries, a plywood and blockboard manufacturer established in 1980; employs 200 people in Jambi.

Nippon Gakki Co Ltd: owns 75% of P T Yamaha Indonesia, which manufactures musical instruments and wooden furniture.

Mitsui Corp: this trading house holds 45.5% (and Mitsui Timber 3.5%) of P T Katingan Timber Co, established in 1973 which logs in Kalimantan for its plywood manufacturing plant in South Sulawesi.

Tokai Kagu Kogyo Co Ltd: this furniture company holds 65% of P T Sri Tokai Indonesia, established in 1975, which employs 160 people producing around 500 television sets and 1000 pieces of furniture per month.

Saito Woodcraft Co Ltd: controls 49% of P T Kediri Wood Industry, established in 1985, which employs 135 people manufacturing teak veneers, furniture and wood mouldings.

Other Japanese investments in Indonesia include pulp-making, from mangrove exploitation, the best known of which is P T Chipdeco, a joint venture of the MDI consortium (see Chapter 4).

Brazil

The situation in relation to Japanese overseas investments in Brazil is complex. As far as timber products are concerned, three types of investment can be found: those centred on pulp and paper making (mostly using wood from plantations of pine and eucalyptus in states south of the Amazon region); those mostly concerned with wood processing (also largely to be found in southern and central parts of Brazil); and processing operations integrated with regional development, which are to be found mainly in the Amazon region.

In the first two categories, some of the main Japanese industrial firms can be found as investors:

Kanematsu Goshō: owns a company established in 1974 which is carrying out reforestation projects with *Paulownia*; KG13-Agro-Comercial e Industrial Ltda.

Kuga Industries: similarly, this firm is investing in *Paulownia* plantations through its Brazilian subsidiary (Kuga Reflorestamento Ltda) established in 1973, based in São Paulo, but which has also been involved in cattle ranching and housing construction.

Mitsui with Hokusan: control two companies in São Paulo, Nortres Industria e Comercio de Madeiras Ltda (a company established in 1973, logging, sawmilling and slicing veneers); and Hox's Inter Moveis Ltda (established in 1974, a firm manufacturing wooden house interiors). Mitsui also owns a Bolivian company, Industria Maderera Suto Ltda, established in 1975 and based in Santa Cruz De La Sierra, which processes sawnwood and sliced veneers.

Oji Paper, C Itoh & Co, etc.: a consortium (called Japan Brazil Paper & Pulp Resources Development Co and consisting of 18 leading Japanese pulp & paper companies) controls 49% of Celulose Nipo-Brasileira S A (Cell Bra), established in 1977, and specializing in the production of bleached sulphate pulp (annual production capacity: 350,000 tonnes). The consortium also owns a forestry plantation company, Empreendimentos Florestais S A, established in Espírito Santo.

Mitsubishi Paper and Marusan: control respectively 2.8 and 12.7% of Papelok S A Industria e Comercio, established in 1974 in São Paulo which manufactures paperkraft and cardboard (around 70,000t per year). Through the Japanese company Eidai Sangyo, Mitsubishi also owns 49.95% of Eidai do Brasil Madeiras S A, which has been processing veneers and plywood in Belem, in the state of Para, since 1979.

Kassuga Paper Co: wholly owns Kassuga do Brazil Industria de Papel Ltda, established in 1975, a paper producing company based in the state of São Paulo.

Shin Asahigawa: is present in Brazil through its subsidiary Shin Asahigawa do Brazil Ltda, which logs, processes wood and is active in reforestation. It was established in the state of Parana in 1972.

Thusho: controls Thusho-Industria Comercio do Artefatos do Mad, which has been processing timber since 1973.

Taiyo Sangyo: has controlled Taiyo Sangyo Industria Comercio do Madeira Ltda, a timber company, since 1973.

The timber activities in which Japanese companies have the biggest impact on forest environment, however, are those developed within Amazonian "integrated" regional development, such as those in the Grande Carajas project. Particularly damaging to the environment are projects involving the exploitation of tropical forests by clear-cutting (followed by reforestation with eucalyptus) for producing charcoal for iron smelters, and for the production of pulp. The problem with these projects is not only their direct destructive impact, but also the way they link with other projects in the same region - such as large dams, mining operations, the opening of rail and road infrastructures, etc.

Appendix D: Summary List of JICA Technical Co-operation Projects in Forestry

This appendix briefly lists and describes a number of JICA aid projects and programmes directly linked with tropical forestry activities, such as timber extraction and commercial forestry, social forestry, research and development, plantations, etc.

These projects are grouped under the three major JICA programmes (described already in Chapter 4.2).

1. General Grant Aid Projects Directly Related to Tropical Forests

There have been very few General Grant Aid projects of this type. Examples are listed below for the years up to 1986 (JICA, 1986; Ministry of Foreign Affairs, 1987). Most of these projects have, in one way or another, been combined with Project-type Technical Co-operation projects. (See Appendix D, section 2).

Philippines, 1978: Construction of the Pantabangan Forest Conservation Training Centre (Yen 1.05 billion).

Indonesia, 1980: Reforestation training centre at Benekat, South Sumatra (Yen 100 million).

Indonesia, 1985: Machinery provision for afforestation in the states of Lanpon and North Sumatra (Yen 481 million).

Indonesia, 1986: Equipment supply for expansion of the Tropical Rain Forest Research Centre at Murawaruman University (Yen 235 million), this project had already received funds under General Grant Aid (Yen 1.5 billion for the construction of the Centre) in 1980.

Burma, 1981: Logging and transport equipment provision (Yen 600 million).

Burma, 1984: Loan aid for No 2 Pulp and Paper Mill Expansion Project (US\$130 million).

Thailand, 1981: Support for Central Forest Research and Training Centre at Bangkok (Yen 2 billion).

Senegal, 1983: Provision of forest fire prevention and fighting equipment (Yen 370 million).

Philippines, 1984: Construction of an agroforestry training and education centre (Yen 1.07 billion).

Philippines, 1984: Provision of fire fighting equipment in Pantabangan (Yen 103 million).

Kenya, 1985: Construction of a nursery training centre for social forestry and rice harvesting (Yen 701 million).

Prior to 1982, JICA also contributed two years' General Grant Aid (Yen 840 million) for the support of integrated agriculture and forestry development centres in Paraguay.

2. JICA (Project-type) Technical Cooperation Programmes in Forestry

Country	Title	Duration	Objective
Burma	Forest Development in the Arakan Range	Dec. 1977-Mar. 1982 (Completed)	Develop timber extraction techniques through use of cable cranes in hill forests, and train forest officers and machine operators.
Indonesia	Mountain Logging Practice in Java	Dec. 1977-Jun. 1982 (Completed)	Technology transfer for mechanized logging to produce pine logs in Central Java.
The Philippines	Afforestation and Forest Conservation in the Pantabangan Area	Jun. 1976-Jul. 1987 (phase 1) Jul. 1987-Jul. 1992 (phase 2)	Develop afforestation techniques and train Philippine forestry personnel in the afforestation of the grasslands through the establishment of a pilot (8,100ha). Conduct theoretical and practical training in forest conservation at the Forest Conservation Training Centre provided under Grant Aid.
Indonesia	Trial Plantation in Benekat, South Sumatra.	Apr. 1979-Apr. 1988	Develop afforestation techniques to be applied to grasslands in South Sumatra. Establish trial plantation (2,100ha) including an agroforestry trial.

	Tropical Rain Forest Research	Jan. 1985-Dec. 1989	Develop forestry research into the sound management of tropical rain forests at the Research Centre provided under Grant Aid.
Thailand	Research and Training in Reforestation	Jul. 1981-Jul. 1986	Develop basic research in reforestation and corresponding organization at the Central Forestry Research and Training Centre, Bangkok provided under Grant Aid. Establish a trial plantation (800ha) and improve reforestation training at Sakasrat, northeast Thailand (a field station also provided under Grant Aid).
	Logging and Log Transport Training	Mar. 1983-Sep. 1988	Develop efficient logging and log transport systems and improve training for the effective utilization and conservation of forest resources in northern Thailand.
Malaysia	Wood Products Research	Mar. 1985-Mar. 1990	Develop research in forest products (wood lamination, wood extractive, wood analysis, wood preservation, wood based panel etc) and upgrade research capabilities of Forestry Research Institute, Kepong.
People's Republic of China	Integrated Wood Utilization Research	Oct. 1984-Oct. 1989	Develop forest products research (sawmilling, timber seasoning, composite wood, wood property, adhesive, etc) and strengthen Integrated Utilization Research Institute of the Heilongjiang Province.
Brazil (completed)	Forestry Research in Sao Paulo	Apr. 1979-Mar. 1986	Develop research in selected subjects (watershed management, mechanized logging, remote-sensing and small diameter timber processing) related to watershed forest management techniques at Sao Paulo Forest Institute.
Paraguay	Forestry Development in Southern Paraguay	Mar. 1979-Mar. 1987	Strengthen forestry training at junior level in silviculture and wood processing at the Centro de Desarrollo Forestal in Itapua Department.
Brunei	Forestry Research	Oct. 1985-Sep. 1990	Develop research in reforestation techniques through a trial plantation aiming to maintain forestry resources.
Kenya	Nursery Training (Social Forestry)	Nov. 1985-Nov. 1987	Develop research in nursery and offorestation techniques in semi-arid area and train forestry personnel at the Nursery Training and Forestry Research Centre established by the Grant Aid Programme.
Peru	Regeneration Trials in the Amazon	Oct. 1981-Oct. 1991	Develop regeneration techniques both natural and artificial for the rehabilitation and conservation of tropical rain forests in the Amazon.
Nigeria	Afforestation trials in semi-arid Area	Aug. 1986-Aug. 1991	Establish reforestation techniques and contribute to the development of science and technology in the management of semi-arid forests.

3. JICA Development Co-operation Programme: the Example of Projects Funded in 1982 list

Country	Project Name	Project Area	Project Objective	Interest Rate	Amount millions of yen
PNG	Buruma Experimental Plantation	W. New Britain	Plantation	0.75	293
PNG	Open Bay Forestry Development Project	E. New Britain	Roads & Bridges	0.75	678
PNG	Hoskins Forestry Development Project	New Britain	Roads & Bridges	0.75	420
Malaysia	Limbang Forestry Development Project	Sarawak State	Roads & Bridges	0.75	200
Malaysia	Un-utilized Tree Species Development	Malacca	Unutilized Tree Species	0.75	299
Philippines	Cagayan de'Oro	Iligan District	Experimental Plantation	2.3	347
Indonesia	Asahan Aluminium Smelting Project	N. Sumatra	Roads & Bridges	2.5	2310
Thailand	Un-utilized Tree Species Development	Trang Province	Unutilized Tree Species	0.75	80
Thailand	Experimental Coffee Cultivation	Nakon Nayok Province	Coffee Cultivation	0.75	206
Brazil	Japan-Brazil Agriculture Co-operation Project	Minas Gerais	Cerrado Development	2.5	4100
Brazil	Taperoa Experimental Station	Bahia State	Plantation	0.75	24.5
Brazil	Majorca Plantation	Para State	Majorca	0.75	25.6
Paraguay	Iguas Experimental Station	Alto Parana	Plantation	0.75	50

The projects shown here are merely examples. This funding framework which targets Japanese industry was inherited by JICA from its predecessor organization, and ranges from 3 to 4 billion Yen annually. The reason that the amounts in the table for large-scale projects such as Asahan stand out, is because they are to be implemented over a number of years. About 25 to 30 companies receive virtually interest-free loans.

Appendix E: List of Political and Economic Institutions Visited and Consulted during the preparation of this report

(those institutions marked with an asterisk were visited by the principal author)

Abe Plywood*

Akita Plywood

Forestry Agency (MAFF)

– Forest Products Division*

Forestry and Forest Products Institute, Tsukuba

– Forestry Management Division*

– Pulp and Paper Unit, Forest Products Chemistry Division*

– Wood Technology Division*

Hokusan Corporation

Institute for Domestic and International Policy Studies*

International Tropical Timber Organization

Japan Plywood Manufacturers' Association*

Japan International Co-operation Agency (JICA)

– Forestry and Fisheries Development Cooperation Department*

– Planning Department*

Japan External Trade Organization (JETRO)*

Japan Overseas Forestry Consultants Association*

Japan Wood Reserve Organization

Marusan Wood Corporation

Ministry of Foreign Affairs

– Economic Affairs Bureau*

Ministry for International Trade and Industry (MITI)

– Construction

– Pulp and Paper*

Nissho Iwai

Overseas Economic Co-operation Fund (OECF)

– Loans Department II*

– Economic Research and Appraisal Department*

Weyerhaeuser (Tacoma headquarters, Roundwood Business)*

Appendix F: a Short Glossary of Technical Terms and Abbreviations

Agroforestry: system of mixed arable and farming and forestry usually designed to combine shifting cultivation with commercial crops and tree crops. Designed particularly for tropical forest regions and to ensure that local people enjoy continuous food supplies and economic returns, without damaging the ecosystem service functions of the forest and soils.

Apitong: commercial name given in the Philippines to timber from *Dipterocarpus grandiflorus*, used in the 1960s in Japan for the manufacture of plywood.

Blockboard: see plywood.

Biological diversity: the full variety of life on earth, taking into account the number of species (richness), level of ecological complexity of habitats, and genetic diversity both within and between species.

Chips & particles: wood which has been processed into small pieces, for pulping, board production, fuel, etc.

CIF: (cost, insurance, freight) a term used in international trading to explain that a price includes transport and insurance costs.

Coniferous wood: all timber products from trees classified as Gymnospermae, such as cedar, hemlock, larch, fir, spruce, etc. Also referred to as softwoods.

Coupe: the area where tree felling takes place.

Dipterocarp: tree of the genus *Dipterocarpus*. South and Southeast Asian trees characterized by two wings at the top of the fruit, and forming a staple of the timber industry in this region.

Econometric model: a formally specified mathematical set of relationships between economic variables representing an economy, and in which the parameters are estimated by econometric (ie established through statistical tests) methods.

Environmental Impact Assessment (EIA): An attempt to identify and predict the impact on the biogeophysical environment and on human health and well-being of proposed industrial or commercial developments, projects or legislation.

Environmental sustainability: quality of a management system which guarantees: the maintenance of essential ecosystem processes; the maintenance of biological diversity, as well as all endemic and important species in each local ecosystem; the maintenance of harvests of various products (not only timber) at levels which do not jeopardize sustainable yields in the future; the satisfaction of the needs of people living in and around the forests (if this last condition is not fulfilled, encroachment will inevitably occur, as well as considerable human poverty and misery).

FAO: the United Nations Food and Agriculture Organization.

Fibreboard: panel made of wood (or other lignous material) fibres, bonded through felting and compression and natural adhesive properties of material. Other bonding materials and additives are often added in order to improve certain panel qualities. The main types are insulation boards (which are low density, non-compressed panels), hardboards (which are high density, compressed panels often with resin additives), and medium density fibreboard (MDF – which is a panel of similar density to sawnwood, has good workability qualities – for instance for mouldings and furniture – and contains a significant amount of resin additives). It is not yet popular in Japan.

FOB: (free on board) a term used in international trading to explain that price does not include transport and insurance costs.

Hardwood: see Non-coniferous.

Hoppus foot: a name for the customary "cubic foot" volume content of roundwood (such as logs). It involves multiplying the length in feet by the square of the quarter girth in inches, then dividing the result by 144. In effect, the Hoppus foot is on average 27% less than the true cubic foot measurement (note: 1 foot = 30.48cm).

ITTA: the International Tropical Timber Agreement.

ITTO: the International Tropical Timber Organization.

IUCN: the International Union for Conservation of Nature and Natural Resources.

JETRO: Japan External Trade Association.

JFTA: Japan Forestry Technical Association.

JICA: Japan International Co-operation Agency.

JOFCA: Japan Overseas Forestry Consultants Association.

JPA: Japan Paper Association.

JPMA: Japan Plywood Manufacturers Association.

JSSTA: Japan South Seas Timber Association.

JTA: Japan Tariff Association.

JWRO: Japan Wood Reserve Organization

Kon-pane: plywood sheets made of tropical hardwood, used in Japan since the 1960s for concrete forms ("shuttering" or panels).

Kraft paper: strong paper made from pulp processed with a sulphate solution.

Laminated timber: timber pieces made of several layers of smaller sawn pieces bonded together (under pressure) with glues or resins. Laminated timber has similar physical characteristics for joinery, as large (and more expensive) pieces of sawnwood.

Logs: roundwood of a minimum diameter and length, for slicing, peeling or sawing (one speaks of sawlogs and veneer logs).

MAFF: Japanese Ministry of Agriculture, Forestry and Fisheries.

Market transparency: a characteristic of a perfectly competitive market, in which information about deals is immediately and fully conveyed to all the participants.

MDF: see Fibreboard.

MITI: Japanese Ministry of International Trade and Industry.

Non-coniferous: all woods from trees classified as Angiospermae, such as teak, mahogany, meranti, ramin, oak and beech. The trees are also referred to as broadleaved, and the wood as hardwood.

Multiple use management: a type of forest management which aims to optimize the long-term sustainable productivity of the forest in regard to varied primary and secondary forest products such as bush-meat, rubber, nuts, medicinal plants, timber, etc.

Old growth: a forest (or tree formation), natural or planted by man, that has not been logged-over for a long time, in which dominant tree species and vegetation systems have gone through at least one generation of maturation and decay without any significant human intervention or management. A term often employed in the context of forestry in North America.

Oligopolistic: used to define a market structure in which sellers are few, and are aware of their mutual interdependence concerning price-making and levels of sales. In such a market, competition is not "perfect".

Particle board: panels made of particles or chips bonded together with a resin or glue using a physical process (heat, pressure, humidity, etc.). The most common types are chipboards.

Plywood: panels made of more than two thin surfaces of wood (sheets or strips). Veneer plywood is the most common type; made of more than two veneer sheets (two "faces" and one or more "core" sheet), crossed at right angles. Core plywood contains a thick central "core" layer made of blocks or strips of wood (blockboard is a type of core plywood).

Pulp (or wood pulp): a product in which the lignous fibres of wooden materials have been separated and are ready for the manufacture of paper or paperboard. Pulp is obtained by subjecting pulpwood to a series of treatments such as mechanical grinding, chemical processing, etc. Tropical hardwood is mostly pulped through a dissolving process (for the production of cellulose or other non-paper materials) or through sulphate processing, in which the small pieces of wood are cooked in a pressure vessel in the presence of a mixture of sodium hydroxide and sodium sulphite (this pulp is then used to make kraft paper). The exception is mangrove chips, which are used for higher quality paper.

Pulpwood: wood in the rough, in any form, split or round, for making pulp, fibreboard or particle board. Often includes wood residues.

Rattan: several species of the genus Calamus. Liana-like climbing palms growing mostly in South and Southeast Asia, and notable for their jointed and pliable stems.

Rent: "a value in excess of the total costs of bringing trees to market as logs or wood products, including the cost of attracting the necessary investment. That cost may include a risk premium that reflects uncertainties about future market and political conditions, so there are inevitably doubts about the exact magnitude of available rent.

Theoretically, all rent can be captured by governments as a revenue source that stems from the country's advantageous natural resource assets. In practice, royalties, land rents, license fees, and various harvest taxes are all means of converting rent into government revenues. To the extent that it is not captured, a rent remains as a source of greater-than-normal profits for the timber contractor, or as a cushion for defraying excess costs" (Repetto, 1988).

Roundwood: wood in the rough, including all wood felled and harvested, in any form; it mostly includes logs, fuelwood, pulpwood and other minor categories such as pit props for mines and poles. The term Industrial roundwood includes all these commodities except fuelwood.

Royalties: payment, usually a share of the profits or of the value of products, made to the owner, or rights holder, for the right to use or work a property. In the case of timber logging operations, royalties are paid by the concession licensee to the state, or to the community rights holder, etc.

Roundwood equivalent (RWE): The "under-bark" log volume which would have been necessary to obtain one unit of volume of the processed product. For instance, FAO uses an RWE volume coefficient of 1.82 for hardwood sawnwood; this means that, on average, 1.82m³ of hardwood logs are used to obtain 1m³ of sawnwood. (see also Appendix A).

Shipper: exporting company (but not the freight company).

Softwood: see coniferous.

Sogo shosha: Japanese general trading company (see also Box 7).

Sustainable management: a management system which allows and organizes the reproduction of the resource being exploited, in order to guarantee that available yield will not decrease. In the case of forestry, this does not necessarily correspond to environmental sustainability (see also Box 3).

Sustainable yield: level of extraction of the commercial resource (ie timber) per year which guarantees not to reduce the long-term commercial biomass equilibrium volume.

Stumpage price: the price fetched by standing timber before logging.

Sylviculture: forestry practices aiming at optimizing the future production of, say, timber. It can include plantation (by seeds or seedlings), thinnings, selective felling, fertilizing, enrichment planting, etc.

Tatami mat: thin mat made of fibres, used in Japan as mattress, and which can be rolled and stored away during the day.

Tropical timber: in trade terms, this commodity category does not include all commercial timber extracted from tropical tree formations; it includes tropical hardwood timber only (softwood timber is only included when it is incorporated in a processed product made mostly from tropical hardwood, for instance tropical plywood in which the central core layer is made partly from softwood).

Thinnings: timber, generally of small diameter and short length, obtained when reducing the density of trees in a plantation.

TFAP: the Tropical Forestry Action Plan.

UN/ECE: the United Nations Economic Commission for Europe.

Veneer: thin sheets of wood of uniform thickness, obtained by slicing, sawing or, more frequently, peeling (rotary cut) logs. Decorative veneers are often used to face plywood for furniture, for instance.

Yarding: transport of logs from the felling site to the loading track or area. It can be performed by cable pulling, vehicle, aerial cable, etc.

Part Five: References and Bibliography

- Akai H, 1988:** "Policy for the Stabilization of the Supply, Demand and Price of Timber", in Handa R, ed, *Forest Policy in Japan*, Nippon Ringyo Chosakai (Association for Research and Publishing on Japanese Forestry), Tokyo.
- Amano M, et al, 1985:** "Timber Supply Projection Model for Private Forests in Japan", Forestry and Forest Products Research Institute, Tsukuba.
- Armstrong C, 1988:** "Japanese Third World Development Aid: Plagued by Bureaucracy, Private Sector", *Asahi Evening News*, 13th May 1988, Tokyo, p6.
- Anti-Slavery Society, 1983:** "The Philippines: Authoritarian Government, Multinationals and Ancestral Lands", *Indigenous People and Development Series*, Report no 1, London.
- APIC, 1987:** "A Guide to Japan's ODA", Association for the Promotion of International Co-operation, Tokyo.
- Arnold J E M, 1987:** "Community Forestry", *Ambio*, Volume 16, nos 2-3, pp122-128.
- Asiaweek, 1988:** "Rape of the Rain Forest", 25th November 1988, pp40-45.
- Asian Timber, 1986:** "Logging Concessions are Cancelled", July/August 1986, London, p6.
- Asian Timber, 1986b:** "Major Changes in Japan", July/August 1986, London, pp27 & 31.
- Asian Timber, 1988:** "Enquiry Unearths PNG Malpractices", May 1988, London, p4.
- Aubreville A, 1947:** "The disappearance of the Tropical Forests of Africa", *Unasyva*, Vol 1, No 1, Food and Agricultural Organization, Rome, pp57-59.
- Bello W et al, 1982:** "Technocrats versus Cronies", in Bello W, Kinley D, Elinson E, *Development Debacle: The World Bank in the Philippines*, Institute for Food and Development Policy, San Francisco, pp183-193.
- Bingham C W, 1984:** "Rationale for Intensive Forestry Investment: A 1980s View", in: Sedjo R A, ed, *Investment in Forestry*, Westview Press, Boulder.
- Biro Pusat Statistik, 1988:** "Indonesia Foreign Trade Statistics - Vol 1: Exports", Jakarta.
- Burbridge P R, 1988:** "Coastal and Marine Reserve Resource Management in the Strait of Malacca", *Ambio*, Volume 17, number 3, pp170-177.
- Bureau of Forest Development, 1987:** "1986 Philippine Forestry Statistics", Bureau of Forest Development, Ministry of Natural Resources, Quezon City.
- Burgess P, 1988:** "Asia - Regional Report and Country Reports", in: International Institute for Environment and Development, *Natural Forest Management for Sustainable Timber Production*, Report for the ITTO, London.
- Caufield C, 1985:** "In the Rainforest", Heinemann, London; Knopf, New York.
- Chapman V G, 1977:** "Wet Coastal Ecosystems", in Chapman V G, ed, *Ecosystems of the World*, Vol 1, Cramer, Valduz.
- Clad J, Vitug M D, 1988:** "The Politics of Plunder", *Far Eastern Economic Review*, 24th November 1988, pp48-52.
- Commission of the European Communities, 1986:** "Fourth Environmental Action Programme of the EEC 1987-92", COM(86)485 Final, Brussels.
- Contreras J, Margolis M, 1988:** "Amazon in Peril: Scientists Battle to Rescue the Rain Forest from the Ravages of Man", *Newsweek*, 30th January 1989, pp40-45.
- Daniel J, 1988:** "The Canadian Cut", *Wilderness*, Vol 52, No 182, Fall 1988, Washington, pp61-64.
- De'Ath C, 1980:** "The Throwaway People: Social Impact of the Gogol Timber Project, Madang Province", Monograph No 13, Institute of Applied Social and Economic Research, PNG.
- Department of Statistics (Peninsular Malaysia), 1988:** "Peninsular Malaysia Trade Summary - December 1987", No 12, Kuala Lumpur, 22nd February 1988.
- Department of Statistics (Sabah), 1988:** "Sabah Monthly Statistics - January 1988", Kota Kinabalu, 11th February 1988.
- Department of Statistics (Sarawak), 1988:** "Preliminary Figures of External Trade - December 1987", Kuchin, 16th February 1988.
- Dorral R, 1979:** "Tinggian: The Case Against Cellophil", *WHO Magazine*, 13th January 1979.
- ECE/FAO, 1986:** "European Timber Trends and Prospects to the Year 2000 and Beyond", United Nations Economic Commission for Europe and Food and Agriculture Organization, Geneva.
- ECE, 1987:** "Forest Products Trade Flow Data 1985-86", *Timber Bulletin*, Vol XL, No 7, United Nations Economic Commission for Europe and Food and Agriculture Organization, 31st July 1987, Geneva.
- ESCAP, 1986:** "Environmental and Socio-economic Aspects of Tropical Deforestation in Asia and the Pacific", *Proceedings of the Expert Group Meeting*, 28 January to 3 February 1986, Economic and Social Commission for Asia and the Pacific, UN, ST/ESCAP/486, May 1986, Bangkok.

Economic Planning Agency, 1987: "Economic Survey of Japan 1986-87", August 1987, Tokyo.

Elliott C, Rose C, 1987: "Defining Sustainable Use of Tropical Moist Forests", WWF Special Report No 1 - Conservation of Tropical Forests, WWF International, Gland.

Eurostat, 1988: "Basic Statistics of the Community", Statistical Office of the European Communities, 25th Edition, Brussels.

Environment Agency, 1986: "Quality of the Environment in Japan 1986", Tokyo, December 1986.

Environment Agency, 1987: "Tokyo Meeting of WCED Finalizes Its Report", Japan Environment Summary, Vol 15, Special Issue, March 1987, Tokyo.

Environment Agency, 1988: "White Paper on the Environment in Japan 1988", Tokyo, May 1988.

Environmental Defense Fund: "The Failure of Social Forestry in Karnataka", The Ecologist, Vol 17, No 4-5, pp151-154.

FAO, 1972: "Environmental Aspects of Natural Resources Management: Forestry", Document prepared for the UN Conference on Human Environment held in Stockholm, Food and Agriculture Organization, UN, Rome.

FAO, 1985: "Tree Growing by Rural People", Forestry Paper 64, Rome.

FAO, 1987: "1985 Yearbook of Forestry Products - 1974-1985", Food and Agriculture Organization, UN, Rome.

FAO, 1986: "Forest Products - World Outlook Projections 1985-2000", Forestry Paper No 73, Food and Agriculture Organization, UN, Rome.

FAO, 1988: "1986 Yearbook of Forestry Products - 1975-1986", Food and Agriculture Organization, UN, Rome.

Financial Times, 1988: "Domestic Demand Buys Japan's General Traders", 16th December 1988, London.

Forestry Agency, 1981: "Forestry in Japan", JFTA, Ministry of Agriculture, Forestry and Fisheries, 25th August 1981, Tokyo.

Forestry Agency, 1987a: "Forestry Long Term Projections - Explanatory Report", Ministry of Agriculture, Forestry and Fisheries, Tokyo (in Japanese).

Forestry Agency, 1987b: "Report on Demand and Supply of Timber", Economic Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries, Tokyo (in Japanese).

Forestry Agency, 1988: "Abstract of Forestry and Forestry-Related Statistics", Ministry of Agriculture, Forestry and Fisheries, May 1988, Tokyo (in Japanese).

Forestry Agency, undated: "Forestry and Forest Industries in Japan", JFTA, Ministry of Agriculture, Forestry and Fisheries, Tokyo.

Fortes M D, 1988: "Mangroves and Seagrass Beds in East Asia: Habitats Under Stress", Ambio, Vol XVII, No 3, pp. 207-213.

Friends of the Earth, 1987: "The Good Wood Guide", FoE, London.

Gillis M, 1980: "Fiscal and Financial Issues in Tropical Hardwood Concessions", Development Discussion Paper No 110, Harvard Institute for International Development, Harvard University, Cambridge, Mass, December 1980.

Gillis M, 1984: "Multinational Enterprises, Environmental and Resource Management Issues in the Tropical Forest Sector in Indonesia", Development Discussion Paper No 171, Harvard Institute for International Development, Harvard University, Cambridge, Mass, 30th May 1984.

Gillis M, 1987: "Multinational Enterprises and Environmental and Resource Management Issues in the Indonesian Tropical Forests Sectors", in Pearson C S, ed, Multinational Corporations, Environment and the Third World: Business Matters, WRI Book, Duke University Press, Durham, pp64-89.

Goldsmith E, Hildyard N, 1984-7: "The Social and Environmental Effects of Large Dams", 3 volumes, Wadebridge Ecological Centre, Cornwall.

Gomez E D, 1988: "Overview of Environmental Problems in the East Asia Seas Region", Ambio, Vol XVII, No 3, pp166-169.

Gonzaga L, 1981: "The Government Steps in Again", Far Eastern Economic Review, 31st July 1981, pp78-81.

Gradwohl J, Greenberg R, 1988: "Saving the Rain Forests", Earthscan, London.

Grainger A, 1980: "The State of the World's Tropical Forests", The Ecologist, Vol 10, No 1, January 1980, Wadebridge, pp6-55.

Grynberg R, 1987: "Our Logs are Virtual Giveaways", The Times of Papua New Guinea, 14th-20th May 1987, Boroko, p6.

Handa R, ed, 1988: "Forest Policy in Japan", Nippon Ringyo Chosakai (Association for Research and Publishing on Japanese Forestry), Tokyo.

HIDD, 1988: "The Case for Multiple-Use Management of Tropical Hardwood Forests", Harvard Institute for International Development, Report for the ITTO, Cambridge, Mass.

Houghton R A et al, 1987: "The Flux of Carbon from Terrestrial Ecosystems to the Atmosphere in 1980 Due to Changes in Land Use: Geographic Distribution of the Global Flux", Tellus, February-April 1987.

Inoue M, 1988: "Background to Deforestation – Its Socio-Economic Mechanism", Ryngyo Keizai ("Forest Economy"), No 480, October 1988 (in Japanese).

International Development Journal, 1988: "Ministry of Foreign Affairs: An Interview with Mr K Ohshima, Head of Economic Co-operation Planning Division", March 1988, Tokyo (in Japanese).

IUCN, 1988: "Sarawak: Conservation of Biological Diversity and Forest Ecosystems", draft of a briefing document prepared by the IUCN Tropical Forest Programme, Gland.

Izumi E, 1988: "A Brief History of Japanese Forests and Forestry up to the 19th Century", in Handa R, ed, Forest Policy in Japan, Nippon Ringyo Chosakai (Association for Research and Publishing on Japanese Forestry), Tokyo.

JETRO, 1980: "Fancy Wood", Japan External Trade Association, Access to Japan's Import Market, No 24, Tokyo.

JETRO, 1982: "Directory of Affiliates and Offices of Japanese Firms in the ASEAN Countries", Japan External Trade Organization, August 1982, Tokyo.

JETRO, 1983: "The Role of Trading Companies in International Commerce", Japan External Trade Organization, JETRO Marketing Series No 2, Tokyo.

JETRO, 1985a: "Prefabricated Houses", Japan External Trade Organization, Your Market in Japan Series, Mini Report No 9, February 1985, Tokyo.

JETRO, 1985b: "Wooden Fittings (Doors and Window Frames)", Japan External Trade Organization, Your Market in Japan Series, Mini Report No 17, September 1985, Tokyo.

JETRO, 1986a: "Wooden Furniture", Japan External Trade Organization, Your Market in Japan Series, No 31, 2nd edition, March 1986, Tokyo.

JETRO, 1986b: "List of Japanese Investment Projects in Indonesia 1986", Japan External Trade Organization, Tokyo.

JETRO, 1988: "Japan's Agricultural Standard for Plywood for General Use", Japan External Trade Organization, Information Service, SIS-8, Tokyo.

JFTA, 1982: "Wood Supply and Demand in Japan", Japan Forestry Technical Association, Forestry Agency, Ministry of Agriculture, Forestry and Fisheries, 25th March 1982, Tokyo.

JFTA, 1986: "Wood Industries in Japan", Japan Forestry Technical Association, Forestry Agency, Ministry of Agriculture, Forestry and Fisheries, March 1986, Tokyo.

JICA, 1977: "Report of Feasibility Study for Reforestation Co-operation Project in Madang, Papua New Guinea", Japan International Co-operation Agency, February 1977, Tokyo.

JICA, 1986: "Forests and Green Co-operation", Japan International Cooperation Agency, Tokyo (in Japanese).

JICA, 1987a: "Annual Report 1987", Japan International Co-operation Agency, Tokyo.

JICA, 1987b: "Japan International Co-operation Agency", Japan International Co-operation Agency, Tokyo.

JICA, 1987c: "Co-operation for Tomorrow's Forests: Outline of Forestry Activities", Japan International Co-operation Agency, Tokyo.

JICA, 1988c: "Evaluation Activities of JICA", Japan International Co-operation Agency, Tokyo (unpublished paper).

JICA/OECF, 1988: "Outline Report of Aid Study Group on the Environment", Japan International Co-operation Agency.

JOFCA, 1986: "Markets for Tropical Hardwoods in Japan", Japan Overseas Forestry Consultants Association, for the FAO Forestry Department and the Asia-Pacific forest Industries Development Group, Tokyo, April 1986.

JPA, 1987: "Pulp and Paper Statistics", Japan Paper Association, Tokyo.

JPA, 1988: "Pulp and Paper Statistics", Japan Paper Association, Tokyo.

JPMA, 1981: "Report on a Survey into Trends in Supply and Demand for Plywood", Tokyo.

JPMA, 1987: "Plywood Industry in Japan", Japan Plywood Manufacturers' Association, Tokyo.

JPMA, 1988: "Statistics of Plywood", Vol 25, No 1, 1988/1, Japan Plywood Manufacturers' Association, Tokyo.

Jhamtani H, 1988: "Revealing the Rage in the Forest", Environesia, Vol 2, No 1, February 1988, Whali (Indonesian Environmental Forum), Jakarta.

Japan South Seas Timber Association, 1976: "South Sea Timber History", Tokyo (in Japanese).

Japan Tariff Association, 1988: "Japanese Exports and Imports 1987/12 – Commodity by Country", Tokyo.

Japan Tariff Association, 1988: "Japanese Exports and Imports 1986/12 – Commodity by Country", Tokyo.

Japan Wood Reserve Organization, 1988: "Survey Report on Timber Demand Trends", Tokyo (in Japanese).

Johns A D, 1988: "Long-term Effects of Selective Logging Operations on Malaysian Wildlife: Two Case Studies", WWF Project 3783, University of Aberdeen.

Johnson B et al, 1987: "Project Concepts to Promote the Utilization and Conservation of Tropical Forests", WWF International, Gland.

Kami Pulp, 1985: "Importation of Pulpwood from the Region of South East Asia", Japan Paper Association, February 1985, Tokyo (in Japanese).

Kartawinta K et al, 1981: "The Impact of Man on a Tropical Rain Forest in Indonesia", *Ambio*, Vol X, No 2-3.

Kato T, 1986: "The Postwar Structural Changes of the US Forest Products Industry and the Incidental Effects on the Japanese Market: I - Distinctive Features of Macroscale Changes", *Bulletin of the Forestry and Forest Products Research Institute*, No 337, Ibaraki (in Japanese).

Kato T, 1987: "The Postwar Structural Changes of the US Forest Products Industry and the Incidental Effects on the Japanese Market: II - Strategies to Expand Off Shore Markets and Step up Export Price Controls", *Bulletin of the Forestry and Forest-Products Research Institute*, No 342, Ibaraki (in Japanese).

Knees S G and Gardner M F, 1983: "Mahoganies: Candidates for the Red Data Book", *Oryx*, Fauna and Flora Preservation Society, Vol 17, April 1983, Blackwell Scientific, Oxford.

Kojima K, Ozawa T, 1984: "Les Sociétés Japonaises de Commerce Général", Organization for Economic Co-operation and Development, Paris.

Kraar L, 1981: "The Philippines Veers Towards Crisis", *Fortune*, 27th July 1981, pp36-39.

Krause L B, Sekiguchi S, 1976: "Japan in the World Economy", in Patrick H, Rosovsky H, eds, *Asia New Giant: How the Japanese Economy Works*, The Brookings Institution, Washington DC, pp383-458.

Kumasaki M, 1989 (in press): "Forestry Use and Conservation in Japan", in *Proceedings of the 1988 Tsukuba Asian Seminar on Agricultural Education*, held on 17-18th October 1988 in Tsukuba University.

Langley J P, 1982: "Tropical Forests Resources", Food and Agriculture Organization, Forestry Paper 30, Rome.

Malaysian Digest, 1987: "Indonesia to Purchase More Logs from Sabah", April 1987.

MAFF, 1985: "Survey of the Structure of Timber Distribution", Ministry of Agriculture, Forestry and Fisheries, October 1985, Tokyo (in Japanese).

MAFF, 1987: "Basic Plan for Japan's Forestry Resources and Long-term Demand and Supply Projection for Important Forestry Products", decided at a Cabinet Meeting on 24th July 1987, Ministry of Agriculture, Forestry and Fisheries, Tokyo.

MAFF, 1988: "Monthly Statistics of Agriculture", Forestry and Fisheries, 3/1988, Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries, Tokyo.

MITI, 1987: "Yearbook of Paper and Pulp Statistics", Ministry of International Trade and Industry, Tokyo (in Japanese).

Malingreau J P, Tucker C J, 1988:

"Large-scale Deforestation in the Southeastern Amazon Basin of Brazil", *Ambio*, Vol XVII, No 1, pp49-55.

Mallinson T S, 1988: "The Impact of Market Development on Forest Utilization and Conservation in the Tropics - Safeguarding the Resource", paper presented on behalf of the UCBT at the ITTO Seminar on Sustainable Utilization and Conservation of Tropical Forest, 12th November 1988, Yokohama.

Masuda M, 1988: "International Co-operation in Forestry", in Handa R, ed, *Forest Policy in Japan*, Nippon Ringyo Chosakai (Association for Research & Publishing on Japanese Forestry), Tokyo.

Mergen F, J R Vincent, eds, 1987: "Natural Management of Tropical Forest", Yale University, New Haven.

Muntingh H, 1988: "Motion for a Regulation of the Trade in Tropical Timber and Products Containing Tropical Timber with the Aim to Support the Management and Protection of Tropical Forests", Committee on the Environment, Public Health and Consumer Protection, Brussels.

Myers N, 1980a: "Conservation of Tropical Moist Forests", National Academy of Sciences, Washington DC.

Myers N, 1980b: "The Present Status and Future Prospects of Tropical Moist Forests", *Environment Conservation*, Vol 7, No 2, pp101-114.

Myers N, 1981: "The Sinking Ark", Pergamon, London.

Myers N, 1984: "The Primary Source - Tropical Forests and the Future", W W Norton, New York.

Ministry of Construction, 1988a: "Annual Statistics on Construction", Economic Affairs Bureau, Tokyo (in Japanese).

Ministry of Construction, 1988b: "White Paper on Construction 1987", Research Institute of Construction and Economy, Tokyo (first published in Japanese in February 1987).

Ministry of Foreign Affairs, 1988: "Japan's Official Development Assistance: 1987 Annual Report", Tokyo.

Ministry for Forests: "White Paper - Revised National Forest Policy", (Ministry of Forests 1973; reprint 1988 under the authority of the Minister for Forests), Port Moresby.

Montagnon P, 1988: "UK Contractors Sceptical of Untied Japanese Aid", *Financial Times*, 1st November 1988, London.

Morita M, 1986: "Comparative Studies on the Utilization of Conservation of the Natural Environment by Agroforestry Systems", Monsoon Asia Agroforestry Joint Research Team, Kyoto University, Kyoto.

National Census and Statistical Office, 1986: "1985 Foreign Trade Statistics of the Philippines", NCSO, National Economic and Development Authority, Manila.

National Diet of Japan, 1988: "House of Councillors Foreign Relations Committee Meeting Record", 112th Session of the National Diet of Japan, No 4, p169, Wednesday 21st, April 1988 (in Japanese).

National Statistics Office, 1988: "1987 Foreign Trade Statistics of the Philippines", NSO, Manila.

Nectoux F, 1985: "Timber! An Investigation of the UK Tropical Timber Industry", Friends of the Earth, London.

Nectoux F, Dudley N, 1987: "A Hardwood Story - Europe's Involvement in the Tropical Timber Trade", Friends of the Earth, London.

New Scientist, 1988: "Japan Wakes up to the Environment", by M. Cross, 23rd June 1988, pp38-39, London.

Nihon Keizai Shimbun, 1988a: "Marubeni Makes Long-term Deal for Wood Chips", 13th January 1988, Tokyo (in Japanese).

Nihon Keizai Shimbun, 1988b: "ODA in 1988: 0.31% of GNP, 7.3% increase to US\$8 billion", 28th December 1988 (in Japanese).

Nikkan Mokuzai Shimbun, 1988a, (Daily Timber News), "Raw Logs for Plywood Use Arrive from Brazil", 8th November 1988, Tokyo (in Japanese).

Nikkan Mokuzai Shimbun, 1988b, "Annual Plywood Imports Level Certain to Reach 1,800,000m³", 28th November 1988, Tokyo (in Japanese).

Nikkan Mokuzai Shimbun, 1988c, "Japan Timber Import Association Negotiates with SEALPA", 16th November 1988, Tokyo (in Japanese).

Nikkan Mokuzai Shimbun, 1988d, "All Kon-pane for Japan Sold Through Nippindo", 9th December 1988, Tokyo (in Japanese).

Nikkan Mokuzai Shimbun, 1988e: "Forest Development in the Interior of Northern Part of Central Kalimantan, Indonesia", 5th November 1988 (in Japanese).

Nomura, 1988: "Sogo Shosha Shuffle: General Trading Companies Start to Put Their Houses in Order", The Nomura Securities Co Ltd, Institutional Research & Advisory Dept, Basic Series BR 3-88, January 1988, Tokyo.

Nor S M, 1986: "R & D Need to Ensure Asian Timber Supply", World Wood, February 1986, pp21-23.

OECD, 1986: "Foreign Trade by Commodities: Imports 1986", Department of Economics and Statistics, Paris.

OECD, 1988: Japan, OECD Economic Surveys 1987/1988, Organization for Economic Co-operation and Development, July 1988, Paris.

Office of Forests, 1982: Annual Timber Digest 1982, Papua New Guinea Department of Primary Industry, Boroko.

Oka T, 1968: "Bleached Kraft Pulps of Lauan Woods", Japan TAPPI, Vol 22, No 59 (in Japanese).

Oldfield S, 1988: Buffer Zone Management in Tropical Moist Forests, the IUCN Tropical Forest Programme, International Union for Conservation of Nature, Gland.

Ong J E, 1982: "Mangroves and Aquaculture in Malaysia", Ambio, Vol XI, No 4, pp254-257.

Pasca T M, 1988: "The Politics of Tropical Deforestation", American Forests, November/December 1988, Vol 94, Nos 11-12, American Forestry Association, Washington DC.

Plumwood V, Routley R, 1982: "World Rain Forest Destruction - The Social Factors", The Ecologist, Vol 10, No 1, January 1982.

Poore D et al, 1988: "Overview", in International Institute for Environment and Development, Natural Forest Management for Sustainable Timber Production, Report for the ITTO, London.

Poore D, Sayer J, 1987: "The Management of Tropical Moist Forest: Ecological Guidelines", IUCN Tropical Forest Programme, International Union for Conservation of Nature, Gland.

Renner M, 1987: "A Critical Review of Tropical Forests, A Call for Action", The Ecologist, Vol 17, Nos 4-5, p150.

Repetto R, 1988: "The Forest for the Trees? Government Policies and the Misuse of Forests Resources", World Resources Institute, May 1988, Washington.

Rodger I, 1988: "Japan Embarks on Overseas Paper Chase", Financial Times, 6th September 1988, London.

Routley R, Routley V, 1980: "Destructive Forestry in Melanesia and Australia", The Ecologist, Vol 10, No 1.

Sabah Forest Department, 1985: "Sabah Forest Department: A Three Year Plan", Forest Research Center, Sepilok.

Saulei S M, 1984: "Natural Regeneration Following Clear-Fell Logging Operations in the Gogol Valley, Papua New Guinea", Ambio, Vol XIII, Nos 5-6, pp351-354.

Sayer J, Collins M, 1987: "The Tropical Forest Action Plan", WWF Special Report No 1, Conservation of Tropical Forests, WWF International, Gland.

Schreiber V, Schreiber H, 1988: "Implications of Transnational Co-operations' Activities on Environment and Development: The Philippines", Report for the Project "Conflicts around Development and Environment", Institute for European Environmental Policy, April 1988, Bonn/London.

Secrett C, 1987: "Rainforest", Friends of the Earth, London.

Seddon G, 1984: "Logging in the Gogol Valley, Papua New Guinea", *Ambio*, Vol XIII, Nos 5-6, pp345-350.

Sen G, Grown C, 1988: "Development, Crises and Alternative Visions - Third World Women's Perspectives", Earthscan, London.

Sierra Club of West Canada, 1988: "Fact Sheet - British Columbia-Forests", Victoria.

Smith A, 1984: "When the Axe Fell: The Promises That Have Not Been Kept", *The Times of Papua New Guinea*, 23rd February 1984, Boroko, p9.

Solomon S, 1987: "We are not Getting Our Timbers' Worth", *The Times of Papua New Guinea*, 15th-22nd April 1987, Boroko, p4.

Southeast Alaska Conservation Council, 1988: "The Case for Cancelling 50-year Contracts", *The Ravenclaw*, Vol 11, No 4, Juneau.

Statistics Bureau, 1988: "Monthly Statistics of Japan", No 321, March 1988, Statistics Bureau, Management and Co-ordination Agency, Tokyo.

Sun M, 1988: "Japan Prodded on the Environment", *Science*, Vol 241, 15th August 1988, p284.

Suzuki M, 1986: "Notes for Tropical Rainforest Log Export System Report", Tokyo, unpublished.

TTA/NH, 1988: "The Development of a Policy to Assist in Promoting the International Trade in Tropical Timber and the Conservation and Development of Humid Tropical Forests", UK Timber Trade Federation with The Nederlandse Houtbond, 12th September 1988.

Takeo T, 1984: "The Japanese Sphere of Influence: Multinational Investment in Asia", *Ampo*, Vol 16, Nos 1-2, Pacific-Asia Resource Center, Tokyo.

Tanaka Y, 1988: "Environmental Problems Related to Japan's Official Development Assistance and the Multilateral Development Banks", Report for the International Citizens Conference on the World Bank, Environment and Indigenous People, 22nd to 24th September 1988, Berlin, JATAN/FoE.

Thang H C, 1987: "Selective Management System: Concept and Practice", Forestry Department, Kuala Lumpur.

Timber Association of Sabah, 1988: "Facts and Figures - July 1988", Kota Kinabalu.

Timber Digest, 1988: "Papua New Guinea Timber Digest (December 1987)", PNG Department of Forests, Marketing and Statistics Branch, Boroko.

Timber Digest, 1987: "Papua New Guinea Timber Digest (December 1986)", PNG Department of Forests, Economic Branch, Boroko.

Timber Trade Journal, 1988: "Philippines Expect Timber Decline in Next Decade", 30th April 1988, London, p9.

The Times of Papua New Guinea, 1988: 21-27 July 1988, Boroko.

Tottman C, 1985: "The Origins of Japan's Modern Forests", University of Hawaii Press, Honolulu.

Toyo Keizai Shinposha, 1988: "Japan Company Handbook", First Section, Tokyo.

Usami K, 1978: "Tropical Woods as Pulp Stuffs", *JARJA* 9, Vol 12, No 2, Tropical Agricultural Research Center, Ministry of Agriculture, Forestry and Fisheries, Tokyo.

UN, 1984: "International Tropical Timber Agreement 1983", TD/TIMBER/11/Rev 2, United Nations, Geneva, July 1984.

U.S. National Academy of Sciences, 1983: "Ecological Aspects of Development in the Humid Tropics", Washington DC.

Vanucci M, 1988: "The UNEP/UNESCO Mangrove Programme in Asia and the Pacific", *Ambio*, Vol XVII, No 3, pp214-217.

VDH, 1988: "Code of Conduct of the German Tropical Timber Import Trade and Industry", Verein Deutscher Holzeinfuhrhäuser ev.

WCED, 1987: "Our Common Future", World Commission on Environment and Development, Oxford University Press.

Weekend News, 1987: "Why are the Japanese Companies so Anxious to go on Losing Money in PNG?", Vol 8, No 274, 28th March 1987.

Whitmore T C, 1984: "Tropical Rain Forests of the Far East", Second Revised Edition, Oxford University Press, Oxford.

Wilderness, 1988: "Blueprint for Ruin", (by Watkins T H), Vol 52, No 182, Fall 1988, Washington, pp56-60.

Winterbottom R, Hazlewood P T, 1987: "Agroforestry and Sustainable Development: Masking the Connection", *Ambio*, Vol 16, No 2-3, pp100-110.

Wood Technical Division and Forest Products Chemistry, 1975: "The Properties of Tropical Woods. 21: Evaluation of the Wood Properties and Wood Processing Suitabilities of Timbers from Southeast Asia and the Pacific Regions", Bulletin of the Government Forest Experiment Station, No 277, October 1975, Tokyo.

Woodwell G M, Hobbie J E, Hourthon R A, et al, 1983: "Global Deforestation: Contribution to Atmospheric Carbon Dioxide", Science, No 222, pp1081-1086.

World Wood, 1986: "Asia Industry Review: Papua New Guinea", October 1986.

World Resources Institute, 1985: "Tropical Forests: A Call for Action", Washington DC.

Wyatt-Smith J, 1963: "Manual of Malayan Silviculture for Inland Forests", Malay For Rec, Vol 23.

Wyatt-Smith J, 1987: "The Management of Tropical Moist Forest for the Sustained Production of Timber", IUCN/IIED Tropical Forest Policy Paper 4, International Institute for Environment and Development, London.

Yano Research Institute, 1987: "Market Shares in Japan 1987", Yano Research Institute Ltd, Tokyo.

Young A K, 1974: "Internationalization of the Japanese General Trading Companies", Columbia Journal of World Business, Spring 1974, pp78-86.

Yukutake K, 1982: "Econometric Analysis of Timber Market in Japan", Forestry and Forest Products Research Institute, Tohoku.

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Mr. TRAIN. Seven, Congress should urge the World Bank to continue to develop its strategy for protecting biological diversity. This past year a World Bank task force on biological diversity headed by Dr. Russell Mittermeier, WWF Vice President for Science, began to develop a strategy to protect wild plants and animals with special emphasis on areas that are particularly rich in species, such as Madagascar. Over the next year, the bank could assist the long-term protection of millions of species and vital ecosystems through development and implementation of biological diversity action plans.

Eight, Congress should press the World Bank to emphasize energy conservation in its \$2.5 billion power sector lending. Recently, The Osborn Center for Economic Development, a joint program of the World Wildlife Fund and the Conservation Foundation, released a new study, "Power to Spare: The World Bank and Electricity Conservation." The study found that due to inadequate financial capital and mounting environmental opposition to large scale conventional power plants, developing countries are rapidly falling behind in their efforts to increase electricity. And, Mr. Chairman, if I may submit this for the record as well.

The CHAIRMAN. Thank you very much.

[The information referred to follows:]

POWER TO SPARE

(by Julie VanDomelen)

The World Bank and Electricity Conservation--Osborn Center

Foreword

Throughout the developing world and within the development assistance community, there is growing interest in the relationship between natural resource management and long-term economic development. Indeed, virtually all agencies that promote economic development in the Third World are indicating greater concern that environmental degradation could undermine economic progress in many developing countries.

Yet the social, political and economic barriers impeding integration of environmental management into the development process are not well understood. Many rural development projects designed to improve natural resource management—social forestry, soil conservation or integrated pest management projects for example—have faltered. Despite awareness that sustainable economic development requires long-term maintenance of the productivity of the renewable resource base, developing country governments and international development assistance agencies urgently need guidance on utilization and management of critical natural resources.

To call attention to this need to better manage the natural resource base as a foundation for economic development, World Wildlife Fund and The Conservation Foundation in 1987 jointly launched a new center, The Osborn Center for Economic Development. The Osborn Center—named after Fairfield Osborn, a prominent conservationist and investment banker who founded The Conservation Foundation in 1948—is dedicated to demonstrating the importance of wise management and efficient use of renewable natural resources as a prerequisite for economic progress in developing countries.

The rationale for creating The Osborn Center is twofold. First, both World Wildlife Fund and The Conservation Foundation have a deep commitment and concern for improving human welfare and increasing the economic prosperity of people throughout the world. We believe in the imperative of economic development and, in order to further this cause and protect today's economic gains on into the future, we believe that wise management of renewable natural resources is critical.

A second major reason for establishing The Osborn Center is to protect the investments WWF and its in-country partners have made within parks and protected areas over the past quarter-century by working to improve the ecological and economic situation outside these areas. Parks cannot exist as islands of pristine wilderness in a sea of poverty and environmental destruction. If people are hungry for want of arable land, or if forests are diminished outside of a country's protected areas, it is only a matter of time before the integrity of the parks and protected areas will be undermined. The Osborn Center, along with World Wildlife Fund's Wildlands and Human Needs Program, addresses the pressing human and economic needs that must be satisfied if conservation investments are to be protected.

The Osborn Center is responding to the complex challenge of integrating wise use of natural resources into policy and project design in a number of ways. It is sponsoring interdisciplinary research on the long-term importance of natural resource management as a component of economic development. It is supporting innovative field projects in several developing countries that focus on the sound management of renewable resources. A recent grant from the Rockefeller Foundation has enabled the Center to inaugurate a small grants program to support forest policy research in developing countries. Finally, the Center aims to contribute to a better understanding of how conservation can foster long-term economic development through the publication of policy papers and field studies.

Power to Spare: The World Bank and Energy Conservation by Julie VanDomelen represents the first in this series of publications. VanDomelen demonstrates how incorporating electricity conservation into conventional planning for electricity generation could save billions of dollars in scarce investment capital. At the same time,

electricity conservation can reduce the strains on the environment that result from electricity generation—destruction of tropical forests and wildlife habitats from hydroelectric facilities in tropical areas, releases of greenhouse gases and emissions from conventional fossil fuel generating stations, or accumulation of radioactive wastes from nuclear plants. She sketches out a strategy by which the World Bank, the most important lender for energy in developing countries, can incorporate electricity conservation into the mainstream of its energy-sector programs.

Through this and other forthcoming policy papers and field studies, the Osborn Center seeks to advance wise management of natural resources as fundamental to future economic prosperity in developing countries. These publications will show how pervasive destruction of natural resources hinders economic development and how development policies relating to agriculture, forestry, and energy can be improved to promote more efficient and productive utilization of critical renewable resources.

The Osborn Center is one of the exciting new programs that has emerged from the 1985 affiliation of World Wildlife Fund and The Conservation Foundation. Although both institutions have continued to support and advance their traditional programs, the affiliation of these two groups has provided the ability to join field conservation action with attention to overarching policy concerns, to deploy biological and social scientists to address simultaneously key conservation challenges, and to provide a broader range of support to our many partners in conservation throughout the developing world. We at WWF and CF are grateful to the Rockefeller Brothers Fund, Laurance S. Rockefeller, the James and Marshall Field Foundation, and the 600,000 members of World Wildlife Fund whose generous support has enabled us to initiate the innovative programs of The Osborn Center.

William K. Reilly
President

H. Jeffrey Leonard
Director
The Osborn Center

Executive Summary

The World Bank has projected the need for a massive increase in power generation capacity if there is to be a reasonable level of economic growth in developing countries in coming decades. The bank has estimated that to satisfy this demand for electricity, about \$522 billion in total investment in power generation, transmission and distribution will be required in the decade from 1986 to 1995, not including interest costs during construction. This represents a two-fold increase over 1980 capacity levels. Such continuous investments will strain the capital resources and threaten the environmental health of these countries.

The solution to getting around these constraints without sacrificing economic growth objectives lies in using electricity more efficiently. By getting more use out of the kilowatts consumed, developing countries can escape the twin traps of financial insolvency and environmental destruction. This book analyzes the potential for increasing the efficiency of electricity use in developing countries, and the role of international lending agencies like the World Bank in financing higher electricity productivity in the Third World.

Rationale for Promoting Energy Efficiency

Under the current debt burden and general macroeconomic instability of developing countries, investment funds are becoming more scarce. The virtual withdrawal of the international commercial banks

from the Third World limits recourse to one of the traditional sources of external financing for power plants, while austerity measures have limited the domestic resources available to public power companies. Compounding the problem, power plants are capital intensive, require long lead times to bring on line, and have posted losses or very low financial returns in most developing countries.

The potentially devastating effects of power supply projects on the environment are of overriding concern. From the deforestation and destruction of natural ecosystems attributable to the construction of hydroelectric dams, to acid rain and the potential greenhouse effect from burning coal and oil in thermal power plants, power supply systems pose some of the greatest threats to the sustainability of the natural resource base on which economic development must be founded.

Fortunately, technologies and processes have been developed on the demand side that render obsolete the notion of expanding generating capacity regardless of its environmental impact or cost. Demand (or end-use) technologies, such as more efficient air conditioning and light bulbs in the commercial sector and better motors and processes in the industrial sector, can save a substantial share of current energy use *at a lower cost per kilowatt than all competing supply options*. For instance, it has been estimated that by slowing electricity demand by 1 percent per year in developing countries through efficiency improvements, 65 gigawatts of generating capacity could be avoided by 1995 at a *net* savings of about \$100 billion. On a smaller scale, an analysis of South Bombay, India, has shown that simply installing more efficient locally produced light bulbs in shops and homes displaces more than enough capacity to do away with present load restrictions while delivering an economic rate of return of over 50 percent.

An Agenda for the World Bank

The World Bank is the single largest financier of power projects in developing countries. To date, the bank has focused the lion's share of its efforts on increasing generating capacity and improving transmission and distribution systems. Relatively little attention has been paid to raising the productivity of energy use.

Given the bank's central role in financing the energy sector in developing countries, it is urgent that the bank begin to more fully appreciate the broad economic and environmental benefits to be gained from raising energy productivity. To effect this change, a strong policy needs to be formulated and advocated at the highest levels of the bank. Energy efficiency provides a solid platform for making concrete the bank's intentions in environmental protection without sacrificing its legitimate concern of promoting economic growth in the Third World.

Investing in Energy Conservation

One of the greatest challenges in encouraging end-use efficiency is creating mechanisms for investing in this change. Traditional project loans and the more recent generation of policy-based adjustment loans can be used to channel capital into the following general areas: a) industrial and commercial retrofits and installations, b) projects geared to public utilities, c) "on-lending" through financial intermediaries, d) policy-based lending which seeks to influence the regulatory and incentive structure in a given country, e) institutional development, especially of energy ministries and national power companies, and f) technical assistance and training.

Building In-House Expertise

Lack of information about energy-conserving technologies and strategies both within developing countries and within the World Bank itself impedes their adoption. On the bank side, a sound analytical grounding in energy efficiency is required. The main avenues for this information generation include data collection, project analysis, and sector work. With better in-house expertise, the bank will be able to funnel information to less-developed countries (LDCs). To get this information to end users, the bank should fund a broad range of activities, from energy awareness campaigns to full-fledged energy extension services.

Supporting Local Research

Of equal importance is support for local research efforts in LDCs into energy-efficient technologies. The World Bank funds similar

efforts in agricultural development and, perhaps more appropriately, in the industrial export sector. The bank should set a research agenda—based on a single global research system or funded through discrete projects—in energy conservation which includes innovation as well as adaptation of existing technologies to conditions and resources in developing countries.

Putting the Private Sector to Work

Finally, the bank should increase its support for private sector initiatives through the provision of information, creation of better incentive and regulatory structures, and stimulation of private demand through direct public investment. The bank can also call on its affiliate, the International Finance Corporation, to make equity investments in private industrial and energy firms to capture the gains from energy efficiency.

The challenge to the World Bank in the coming years will be to adapt as an institution to the changing constraints and opportunities in the energy sector. By using its comparative advantage as the world's most influential provider of capital and information to developing countries, the bank stands poised to make a substantial contribution to an improved economy and natural environment in the developing world.

Introduction

Developing countries face mounting difficulties in providing reliable and affordable electricity. External and domestic capital constraints occasioned by the growing debt burden and general economic instability have made investment funds all the more scarce in developing countries. Those power supply projects that are able to raise sufficient capital face opposition on environmental grounds. From deforestation and destruction of natural ecosystems caused by hydroelectric dams, to acid rain and the possible greenhouse effect from burning coal and oil in thermal power plants, power supply systems pose some of the greatest threats to the sustainability of the natural resource base on which economic development must be founded. These constraints on massive expansions in electricity supply threaten to retard economic growth in the Third World.

Even as increasing power supplies in developing countries appears more problematic, technologies and delivery systems have been developed on the demand side which can increase dramatically the productivity of the energy used. From more efficient light bulbs to industrial motor controls, new end-use* technologies have appeared on the market which promise delivery of the same energy services

* *End use of electricity refers to the uses for which electricity is consumed, such as lighting, refrigeration, motive power, and heating. This is more specific than the usual breakdown of electricity use by consuming sectors, such as agricultural, industrial, residential, and commercial, because it refers to how electricity is used rather than who uses it. This distinction is important in looking at demand-side electricity-saving measures.*

while using fewer kilowatts. Because productivity gains free up electricity, which can then be used to supply new industries or homes, efficiency is a way of stretching generating capacity. Improvements in energy efficiency offer an economically and environmentally sound alternative to supply expansion, with the added benefits of making local industries more competitive and easing present balance of payments deficits. Capturing this potential for increased electricity productivity will require changes in regulations, dissemination of information, correction of certain market imperfections, and capital investment.

While movement toward an electric-efficient future ultimately depends on the governments and energy consumers of developing countries, international development agencies should also actively support this transformation. Historically, these agencies have financed much of the external investment in Third World power systems. In particular, the World Bank* has played a pivotal role in financing expansions of power supplies. As the World Bank seeks to develop a lending portfolio more responsive to concerns about the environmental problems facing the developing world, energy efficiency provides an economically solid platform upon which the bank can make credible its claim to protect the environment.

This book seeks to frame an agenda for the World Bank's involvement in supporting more efficient use of electricity in developing countries.† Chapter 1 provides a brief description of energy use within less-developed countries (LDCs) and projections of future demand. Chapter 2 looks at the potential for electricity conservation. Chapter 3 gives a profile of World Bank activities in the power sector, including existing efforts to promote energy efficiency. Chapter 4 sets a framework for a more active role by the World Bank, and Chapter 5 describes some of the institutional constraints that must be overcome to render the bank's activities more effective.

* The term *World Bank*, or simply *the bank*, refers to the *International Bank for Reconstruction and Development (IBRD)*.

† While this book focuses exclusively on the World Bank, the general approach should be applied to the regional development banks (*Asian Development Bank, African Development Bank, the Inter-American Development Bank, and the Caribbean Development Bank*), bilateral aid programs, and domestically financed investments.

Electricity in Developing Countries

Recent Developments in the Global Energy Picture

Until the 1980s, conventional wisdom maintained that growth in energy consumption and gross national product (GNP) moved in tandem, such that any reduction in energy consumption would constrain economic expansion. In this view, the economic growth so vital to developing countries was predicated on large-scale expansions of energy supplies. Electricity as an input was still relatively cheap, and the only constraint to building more power stations appeared to be in growth demand.

The success of the Organization of Petroleum Exporting Countries (OPEC) in raising world oil prices in the 1970s fundamentally altered this scenario. For oil-importing countries, higher oil prices meant higher import bills for petroleum products used directly, as in transportation, or indirectly, through the burning of oil to generate electricity. Oil-importing developing countries witnessed lower, and in many cases negative, real growth rates. To offset the threat to their standard of living, most governments of less-developed countries (LDCs) increased their foreign borrowing by tapping into the liquidity in the international financial system caused by the infusion of petrodollars from the surpluses of OPEC nations. Despite the increase in the price of oil, there was no great change in consumption patterns in LDCs, resulting in the further impoverishment of oil-importing developing countries. Indeed, during the 1970s, oil consumption in LDCs continued to grow at an average rate of 6 percent per annum.¹

The market-oriented countries of the Organization for Economic Cooperation and Development responded to the higher price of oil

by using energy more efficiently and shifting away from energy-intensive activities. Per capita energy use in the United States *fell* 12 percent between 1973 and 1985 while per capita GNP *rose* 17 percent.² The results were similar in most of the Western industrial nations. Although recession and a shift into the less energy-intensive service sector were partly responsible, the contribution of improved energy productivity was substantial. Thus, the seemingly axiomatic linkage of GNP growth with energy growth was broken. The experience of developed countries shows that significant improvements in the productivity of energy use are possible without sacrificing output.

Increases in the productivity of electricity use are also possible, though they have been less spectacular than the savings realized in the direct consumption of fuel, such as gasoline for transportation. Between 1977 and 1985 in the United States, oil productivity, counted as GNP per unit of oil consumed, grew at an annual average rate of 5 percent while electricity productivity grew at 0.7 percent. Part of the reason for the slower growth in electricity productivity has to do with a pricing and subsidy structure that discourages conversion to more efficient technologies.* In addition, electricity savings are embodied in relatively new and unfamiliar technologies, the best of which have appeared on the market only in the past year or two. There has been a sixfold gain in the cost-effectiveness of electricity savings in the U.S. over the last five years.

Electricity is particularly important within the overall energy picture because of the intensive capital and environmental leverage deriving from electricity savings. Because energy is wasted in the process of being converted to electricity, every unit of electricity saved in turn saves between three and four units of direct fuel. This proportion is no doubt higher in developing countries, where electricity generation is even less efficient.

* *Electricity in the United States is typically priced at its average, not marginal, cost. Average cost pricing understates the cost of providing an additional unit of electricity to satisfy consumption demands and therefore tends to discourage investments in efficiency. In addition, the annual U.S. electricity bill is about \$140 billion. However, an estimated \$30 billion was spent on direct and indirect subsidies to electricity by the U.S. government, again making electricity look cheaper to consumers.*³

Energy in Developing Countries

Energy consumption by the vast majority of households in LDCs is characterized by the use of wood for cooking, particularly wood obtained through noncommercial channels. As incomes rise, households substitute other sources of energy. Electricity consumption rises in response to demand for better lighting, refrigeration, and cooking facilities, and for the power to run other household appliances. With increasing income, urbanization, and industrialization, electricity has become the fastest-growing form of energy consumption in LDCs, often growing at a rate double that of growth in total energy demand. At present, electricity supplies about one quarter of final commercial energy consumption in LDCs.* The bulk of this consumption is in the industrial sector. Extension of electricity to the residential sector has been slow; despite the rapid growth of electricity consumption, the vast majority of households in developing countries still lack access to this energy source.

Rates of growth in energy consumption by LDCs in recent years have been on average much higher than growth rates in the developed world. For example, the growth of electricity consumption since 1972 in five Asian countries (South Korea, Malaysia, Singapore, the Philippines, and Thailand) is roughly four times the average of that in Western industrial countries.⁴ However, the total generating capacity of some 90 developing countries still accounts for only about 10 percent of the world's total.⁵

Although primary energy use per capita in 1980 averaged 6.3 kilowatts in industrialized countries, LDCs on average consumed only 1 kilowatt per capita (and less than 1 kilowatt when noncommercial energy sources such as fuelwood, dung, and crop residues are discounted).⁶ This would seem to indicate that a massive increase in energy use is necessary in order to attain a standard of living commensurate with the present standard of living of the wealthier countries.

This low level of consumption masks very inefficient use. For instance, LDC industries tend to be much more energy intensive

* Commercial energy consumption refers to energy that is bought and sold through commercial channels, as opposed to freely collected wood or animal dung.

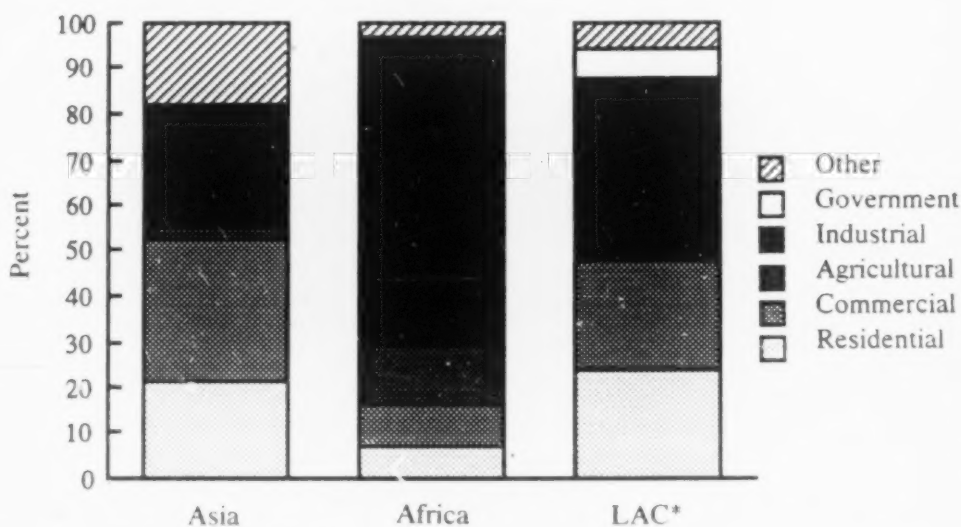
than their counterparts in developed countries because of the scale of plants, technology employed, raw materials used, and institutional capabilities. The recent development of more energy-efficient machines and industrial processes provides an opportunity for LDCs to industrialize and modernize without necessarily creating an insatiable energy demand. A recent study found that using more efficient end-use technologies to serve the needs of a typical developing country, whose needs for energy services resembled those of Western Europe in the 1970s (excluding space heating) would result in a total final energy use per capita of about 1 kilowatt, or only about 20 percent more than the developing countries' average in 1980.⁷

Since 1950, developing countries have invested over \$500 billion in power supply.⁸ Indeed, power projects now account for about one quarter of public capital investments in LDCs, or about 2 percent of annual GNP. Over half of this electricity is used in industry, especially in a few electric-intensive export industries, such as aluminum, steel, fertilizers, chemicals and textiles. Household use ranges from 7 percent of total electricity consumption in China to 46 percent in Nigeria and Indonesia and is applied primarily to lighting, television, fans, and refrigerators.* The commercial and agricultural sectors consume between 10 percent and 40 percent of electricity, with commercial end use concentrated in lighting and cooling of buildings, and electricity consumption by agriculture going mainly to irrigation. Figure 1 shows how electricity sales to each sector vary among Africa, Asia, and Latin America and the Caribbean.

Despite the massive investment, power supply in developing countries is usually inadequate and unreliable. For example, Bombay has experienced 1,000 instances of load shedding, or unscheduled supply interruptions, annually for the past five years. Although this may sound excessive by Western standards, it is not that remarkable in comparison to other developing countries.¹⁰ Power outages and load restrictions erode the productivity of commercial and industrial enterprises. Indeed, industrial users often opt to generate their own power, at a significant added cost (about 20-40 cents per kilowatt hour versus 4-20 cents per kilowatt hour for power from the grid) because of the need for a reliable power supply.¹¹

* The end-use estimates in this paragraph do not include generation of captive power.⁹

Figure 1: Total Electricity Sales by Sector, 1980



*Latin America and Caribbean.

Source: IBRD, *The Energy Transition in Developing Countries*, 1983.

The poor condition of power supply reflects the deteriorating financial position of LDC utilities. Their total debt in 1986 was estimated at \$180 billion, or one fifth of developing countries' accumulated debt.¹² This debt has become increasingly difficult to service because the costs of providing power have increased dramatically since the 1960s. High interest rates have swamped electricity companies with larger than anticipated interest payments. Higher fuel costs have also boosted the cost of generating power. In addition, the most attractive hydroelectric sites have already been developed, leaving higher-cost sites for the future. On the revenue side, electricity rates have not been allowed to rise enough to cover these increased costs. A significant percentage of power generated is lost or stolen in transmission, exacerbating cash flow problems. Additional revenues are unrecoverable because of poor bill collection procedures. These operating deficits have had to be covered by outlays from the public budget.

The poor fiscal condition of most LDCs helps to explain why existing investments in power supply have been allowed to deteriorate. The problem, however, extends beyond insufficient cash flow.

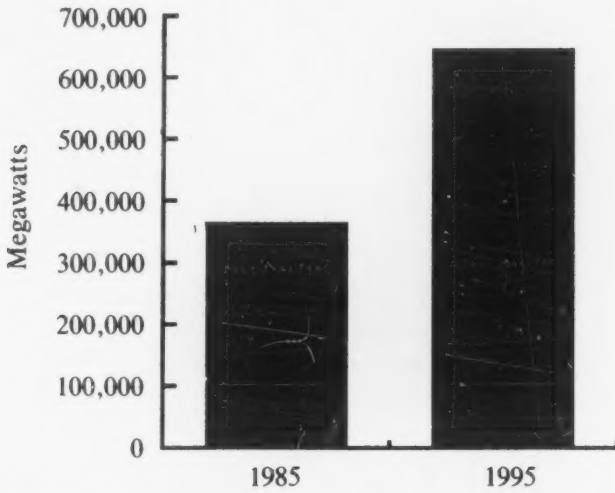
The power companies themselves are run inefficiently, with bloated payrolls, thin managerial capacity, and little internal incentive to perform. The financial and institutional problems together aggravate the power supply situation in developing countries.

Power Generation Projections

The World Bank has prescribed a massive increase in investment in power supply through the end of the century to ensure that economic growth is not thwarted. In its 1983 publication *The Energy Transition in Developing Countries*, the World Bank estimated that \$130 billion (in 1982 dollars) of commercial energy investments would be required annually to meet the energy needs of LDCs. Almost half of this \$130 billion was to be targeted for electricity generation. In 1986, the World Bank revised this estimate downward based on projections of slower growth of electricity demand as a result of slower growth in GNP. The 1986 revision called for a total of about \$522 billion in investments over the decade from 1986 to 1995 in electricity generation, transmission, and distribution, excluding interest expenses during construction.¹³ This represents 285,000 megawatts of incremental capacity at a cost of \$1,830 per kilowatt, *or slightly more than the total installed power capacity in developing countries as of 1980*. In light of the limited availability of foreign and domestic capital to finance such a program, the bank's projections appear totally unrealistic.

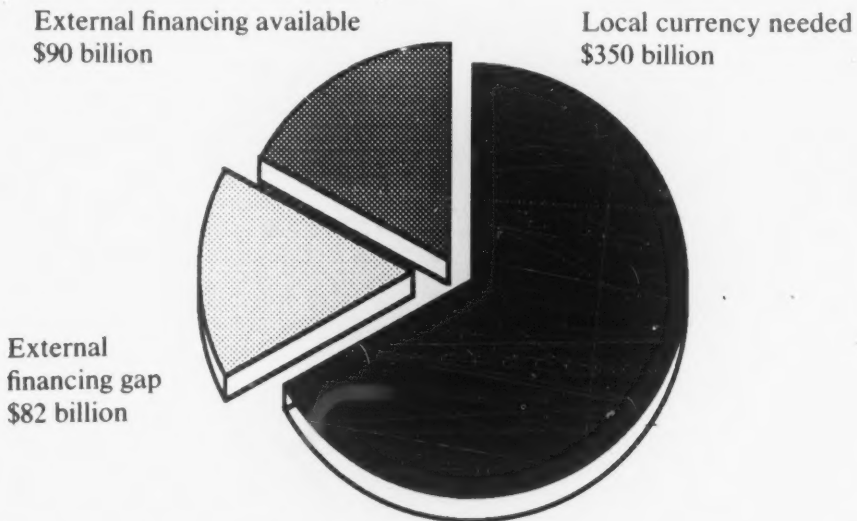
The external financing requirements of doubling the power capacity of LDCs in 10 years are formidable. About 30 percent of the total cost would be required in foreign exchange, representing over \$17 billion annually from 1986 to 1995. Assuming power supply retains its accustomed share of World Bank lending, about \$2.5 billion would be available from the bank annually. An additional \$1.8 billion from the other multilateral banks and \$1.7 billion from bilateral assistance is anticipated, based on past trends. Commercial banks and export credits would finance roughly \$3 billion, down over 50 percent from past levels because of deterioration in borrowers' credit-worthiness. This leaves a shortfall of over \$8 billion annually, or about 50 percent of the foreign exchange requirements of what the World Bank con-

Figure 2: Projected Needs of LDCs



Source: Heron, "Financing Electric Power," 1985.

Figure 3: Sources of LDC Investment in Power, 1986-95



Source: Heron, "Financing Electric Power," 1985.

siders to be a level of power capacity essential to fulfilling economic growth objectives (see figures 2 and 3).¹⁴

Financial constraints on local currency requirements are even more severe. To reach the targets just outlined, \$35 billion in local currency would be needed each year. Under present macroeconomic conditions, this represents a significant commitment of financial resources. Political pressure to keep electricity rates low has impeded accumulation of capital by public utilities. Stringent limitations on growth of public credit and money supply imposed under International Monetary Fund stabilization programs will limit recourse to domestic borrowing by public sector power companies in the foreseeable future. Moreover, any public sector expenditures on power generation will have to be justified in the face of competing claims on public resources, particularly claims for funds to alleviate the costs to the poor of the adjustment of economic structures. A massive effort to redirect capital into the power sector and away from agricultural production, education, health care, or other deserving areas could carry significant costs to society. The shortfall in both domestic and foreign financing requirements calls into question the feasibility of rapid expansion of power supplies in developing countries.

Chapter Two

The Potential for Electricity Efficiency

Rationale

The World Bank has pointed out that "perhaps the greatest obstacle to growth of the power sector is inadequate finance The power sector is a voracious consumer of investment capital and it is expensive to operate."¹⁵ Given the internal and external capital constraints already described, it is extremely likely that without significant improvements in electricity productivity, power supply constraints will act as a brake on economic growth.

While efficiency improvements are not without cost, on average the investment required per unit of energy saved is much lower than that required for competing supply options. The End-Use Global Energy Project concluded:

Large amounts of capital would be required to implement a shift to modern energy carriers and efficient end-use technology and to build the required infrastructure. But our analysis suggests strongly that it would cost less to provide energy services with the more efficient end-use technologies than with conventional end-use technologies and increased energy supplies.¹⁶

Efficiency improvements have a number of benefits in addition to being the most cost-effective means of delivering energy services. Of crucial importance to developing countries is the impact on the balance of payments situation. Developing countries typically use about one third of their imported oil to generate electricity. More efficient use of energy promises an improvement in the balance of payments since a reduction in power consumption would reduce the

amount of oil used to produce this power, thereby lowering a country's import bill.* This reduction is partially offset if energy saving equipment must be imported. Moreover, steep tariffs on imported goods can discriminate against the use of the newest generation of energy saving technologies, effectively delaying the replacement of outmoded equipment. Less-developed countries (LDCs) can amplify the beneficial impact on the trade balance by reducing present tariffs applied to imported energy-efficient technologies and reorienting internal regulations and policies to encourage the local production of these technologies.

The benefits of using energy more efficiently extend beyond these more narrowly defined economic effects. The environmental impacts of power supply systems are attracting global concern. The World Bank projects that between 1980 and 1990 the hydroelectric capacity of developing countries (excluding China) will more than double. The World Bank also projects a threefold increase in coal-fired power plants by the end of the century.¹⁷ The destruction of natural habitats, deforestation, acid rain, and carbon dioxide buildup that this expansion would engender call into question the environmental wisdom of a strategy that is focused so narrowly on supply expansion. As a concrete example, it has been reported that India plans to locate 8 to 10 superthermal power stations in a certain region of the country which would increase India's power capacity tenfold. Adding just three of these plants would increase the ambient levels of sulfur dioxide (the basis for acid rain) to 10 times the proposed national standard for sulfur dioxide levels.¹⁸ At the same time, calls by environmentalists to halt construction of dams and power plants, without providing alternative sources of energy, are equally questionable. Ultimately, environmental protection cannot succeed if the effect is to condemn Third World populations to poverty. Energy efficiency offers an alternate path, satisfying the needs for energy services at the lowest cost without sacrificing the environment.

* For net oil-exporting LDCs, more efficient domestic consumption of electricity generated by thermal power stations frees up more oil for export, which would also have a positive effect on the trade balance.

Strategies for Electrical End-Use Efficiency

In recent years, scientists have developed technologies that greatly improve the efficiency of energy consumption in the industrialized world. Since electricity use in developing countries is distributed slightly differently, LDC priorities are not always the same as those of industrial nations. For instance, while space heating is a large consumer of energy in more temperate climates, most of the Third World is more interested in efficient cooling technologies. The relative pace of infrastructure and industrial development also calls for a slightly different approach from that applied in the countries of the Organization for Economic Cooperation and Development. Within industrialized countries, efforts have focused on retrofitting existing technologies, structures, and processes largely because much of the energy consuming infrastructure and industry is already in place. Nonindustrialized countries are in a better position to take advantage of technological developments in energy efficiency simply because so much of their industrial infrastructure has yet to be developed.

The industrial sector is the largest consumer of electricity in developing countries. The energy efficiency of motors used in industry can be improved by adopting the new generation of efficient motors and using motor speed controls. The nature and extent of the adoption of efficient technologies will vary by industry. A recent World Bank review of energy conservation potential in energy-intensive industries important to LDC economies (iron and steel, aluminum, petroleum, fertilizer, glass, construction materials, cement, pulp and paper, food, and textiles) found that potential energy savings through low-cost housekeeping measures ranged from 2 to 4 percent for aluminum to 10 to 20 percent for cement. Retrofitting and process improvements yielded savings ranging from 5 to 13 percent for steel to more than 85 percent for raw cane sugar processing.¹⁹ The average payback period for these improvements ranged from one to four years. Indeed, the bank reports that easy and cost-effective measures available in the fertilizer industry alone could reduce energy use in that industry by 15 percent, representing an annual saving of .59 billion gigajoules worldwide, with a value of \$2 billion each year.

Within the commercial and residential sectors the most fertile areas for increased efficiency are lighting, air conditioning, and refrigera-

tion. In all cases, there are cost-effective technologies and processes that can dramatically reduce power consumption. For instance, in the past 15 years, electricity consumption of new refrigerator models produced in developed countries has declined by 30 to 70 percent. The World Bank reports that power requirements of the most and least efficient technologies for refrigeration and air conditioning differ by a factor of three. There are many ways to reduce electricity consumption in air conditioning, lighting, and water pumping (see box 1).

The Impact of Efficiency Improvements

Several studies have analyzed the economic impact of energy savings (see box 2). Examining LDCs in general, one study found that

Box 1: Energy-Saving Measures in Air Conditioning, Lighting, and Water Pumping

Air Conditioning

Mechanical Systems

Energy-efficient chillers
Energy-efficient motors
Economizer cycles
Evaporative cooling
Dehumidifiers
Reduced ventilation rates
Variable air volume systems
Proper operations and maintenance
Condenser water sprays and shading

Better water management
Multizoning and Control
Desiccant chillers
Occupancy sensors
Cool storage
Venting of spot heat load
Heat pipe bypasses
Chiller downsizing
Increased air circulation

Architectural Measures

Roof and wall insulation
Reduced air infiltration
Daylighting

Radiant barriers
Spectrally selective glazing
Passive draft towers

slowing the rate of growth in electricity demand by 1 percent per year would immediately save about 19 terawatt hours per year . . . Should the savings be realized, developing countries could avoid adding nearly 65 GW of generating capacity by 1995. This in turn would save developing countries at least \$130 billion in investment costs for electricity supply facilities. Based on the example of Brazil, the net savings might be about \$100 billion.²⁰

Implementing the Strategy

Achieving savings through efficient use of energy requires information dissemination, changes in government regulations, creation of

Efficient artificial lighting
Task lighting
Reduced window area
Window film
Reflective roof paint
Increased thermal mass

Lighting

Better daylight capture
Efficient lamps
Efficient ballasts
Lighting control systems
Better light fixtures

Water Pumping

Low-resistance foot valves
Replace undersized pipes and fittings
Proper sizing of motors and pumps
Electronic speed controls
Better coupling of motors and pumps

Lighter-colored shell
Roof ponds
Vegetation and landscaping
Reflective glass
Roof spray cooling

Improved maintenance
Increased visual effectiveness (e.g., polarizers)

High-efficiency motors
Efficient hydraulic parts
Irrigation load management
Improved maintenance
Power factor correction

Box 2: Conservation Gains from Electricity Efficiency in Brazil

The Brazilian government has embarked on a massive program to expand its electricity generating capacity. The program, known as the Brazil National Electricity Power Plan 1987/2010—or simply the 2010 Plan—is based on official projections of increased future demand for power and forms the basic reference for Brazil's long-term planning in the electricity sector. The centerpiece of the 2010 Plan involves construction of 125 new dams by the year 2010, at a projected cost of \$150 billion.

Currently, Brazil is negotiating with the World Bank for a loan of \$500 million to Brazil's energy sector. The Power Sector Loan II, as it is known, is not intended to finance directly the costs of hydroelectric plants. However, critics claim that World Bank approval of the loan would liberate other government funds, essentially putting the bank's stamp of approval on Brazil's hydropower strategy and easing the government's financing constraints. Despite numerous concerns about the economic, environmental, and financial viability of Brazil's strategy to develop its hydropower resources on such a grand scale, there has not been sufficient consideration by the Brazilian government or World Bank officials of the potential gains from electricity conservation as an alternative form of investment.

One recent study by H. Geller and others concludes that it is technically and economically feasible to implement energy efficiency measures that would eliminate the need to construct plants capable of generating 19 gigawatts of power capacity or roughly two-thirds of planned construction between now and the year 2000.¹ According to this study, power sector planners in Brazil anticipate that electricity demand will grow at a relatively high rate during the remainder of the century. The official demand forecast completed in 1985 by Eletrobrás, the national holding and planning authority for the electricity sector in Brazil, projects that national electricity consumption

will increase at an average rate of 7.4 percent per year between 1985 and 1990, 6.2 percent per year between 1990 and 1995, and 5.6 percent per year between 1995 and 2000.²

To meet this expected growth in demand, Eletrobrás estimates that 95 gigawatts of installed capacity, or roughly 2.3 times the level in service in 1985, will be needed by 2000. Since plants under construction in 1985 could generate approximately 25 gigawatts of capacity, and there already existed plants with 42 gigawatts of operating capacity, the official forecast calls for starting and completing plants capable of an additional 28 gigawatts by 2000.

The major end uses of electricity in Brazil in 1985 can be broken down as follows:

- The *industrial sector* accounted for about 55 percent of total electricity consumption in Brazil, with the iron and steel, nonferrous metals, chemical, and food and beverage industries accounting for most of industrial electricity demand. Motors, followed by thermal processes, consumed the most electricity.
- The *residential sector* accounted for about 20 percent of total electricity demand. Within this sector, refrigerators consumed about 32 percent of the electricity, and water heating and lighting each accounted for about 25 percent of demand.
- The *commercial and public services sector* consumed about 20 percent of all electricity. Lighting is estimated to account for a half and motors a third of the total consumption by this sector.

To arrive at estimates of the overall energy savings potential in Brazil, the authors of the study looked at the projected electricity demand and potential savings in the year 2000 for six major end-use areas (see figure 4). These end uses alone would account for about two-thirds of total electricity consumption in 2000 without efficiency improvements beyond

(Continued)

Box 2: Conservation Gains from Electricity Efficiency in Brazil

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those incorporated in the 1985 Eletrobrás forecast. The potential for additional savings, 83.3 terrawatt-hours, is almost 20 percent of total electricity demand projected for 2000. The savings are gained by employing technologies that are technically and economically feasible and, in many cases, already available in Brazil. Additional savings may be possible in other areas such as water heating and air conditioning. In contrast to the results of the Geller study, Brazil's National Electricity Conservation Program (PROCEL) proposed a conservation target of 41.4 terrawatt-hours for the year 2000.

Converting the savings potential into conservation gains, the Geller study concluded that reducing electricity demand in 2000 by 83 terrawatt-hours could eliminate the need to construct plants that would generate nearly 19 gigawatts of power capacity, or about two-thirds of the planned new capac-

Figure 4: Electricity Demand and Conservation Potential in Brazil (Year 2000)

End-Use Area	Forecast Demand (TWh)*	Savings Potential (percent)	Savings Potential (TWh)
Industrial Motors	164.8	20	33.0
Domestic Refrigerators	24.7	60	14.8
Domestic Lighting	16.5	50	8.2
Commercial Motors	28.0	20	5.6
Commercial Lighting	25.0	60	15.0
Street Lighting	16.8	40	6.7
Totals	275.8		83.3

*Terawatt-hours.

Source: Brazilian Ministry of Mines and Energy, *The 2010 Plan*.

ity (plants not under construction in 1985) projected in the 1985 forecast. Eliminating the need for 19 gigawatts of new generating capacity would save utilities from having to invest at least \$38 billion (in undiscounted 1985 dollars), compared with an investment of only \$8 billion required to put the end-use efficiency measures in place.

One way to assess the magnitude of the benefits accompanying these conservation gains is to look at the impacts of

Figure 5: Brazil—Amazon Basin Hydroelectric Sites



Source: Adam, J. "Plundering the Amazon for Power" *Washington Post*, Nov. 27, 1988.

dam construction on human settlements and the environment. *The Planning Document for Environmental Conservation for the 2010 Plan* provides crude baseline information on hydroelectric plants in various phases of construction (from projects begun in 1987 to those whose construction is planned to begin in 1991).³ The report covers 56 dams whose total installed capacity is approximately 30 gigawatts.

To generate this power, 18,758 square kilometers of land will be converted to reservoirs, with perhaps far larger land areas flooded. Although some survey work has been conducted, there has been no systematic effort to quantify the costs in terms of the lost timber, agricultural productivity, biological diversity, or cultural resources of the land to be flooded. In addition, initial survey work for only some of the projects indicates that over 138,000 inhabitants of urban and rural areas will be displaced by dam construction. The social and economic costs of relocating so many people are not well understood, nor have they been adequately addressed in the 2010 Plan. For a depiction of hydroelectric sites planned for the Amazon Basin, and their proximity to forested areas, see figure 5.

economic incentives, and capital investment. These strategies involve a large number of actors, including the government ministries, private sector technology suppliers, consumers and national power companies. In many countries, energy efficiency campaigns involving appliance labeling, energy audits by local utilities, consumer education, and training programs for utility personnel have increased awareness of the benefits of electricity efficiency. Utilities in the United States in particular have engaged in an entrepreneurial pursuit of saved electricity (see box 3).

While the industrialized countries have been more active in implementing these strategies, some LDCs have also responded. For instance, Singapore's 1980 Energy Rationalization Law requires efficiency labeling on all new household appliances, revises building codes, establishes a national energy conservation center, and pro-

Box 3: Utility-Based Efficiency Programs

Power utilities in the United States have begun aggressively to promote energy efficiency while generating power to satisfy consumers' demand. Utilities wish to satisfy demand without having to incur the high capital costs of building new power plants, the cost of which they may not be able to recoup through higher electricity rates. More important, many efficiency improvements deliver energy services for less than the operating costs of existing power plants. Therefore, while a utility may see revenues fall as a result of efficiency programs, their operating costs fall by more than their revenues do, resulting in higher profits. The programs successfully implemented by utilities include:

■ *Rebates for the installation of energy-saving devices*

Rebates are a way of reimbursing consumers for a portion of what they spend installing more efficient appliances and equipment. A better approach has been to issue rebates based on electricity saved rather than on money spent.

■ *Utility-sponsored loan programs*

Utilities routinely offer either market rate or subsidized (lower-interest) loans to their customers to finance the purchase of energy-saving equipment. Because utilities already have a billing relationship with their customers, transaction costs are low.

■ *Grants and gifts*

Utilities provide free equipment and grants to industrial and residential customers. One utility has allocated industrial modernization grants on the basis of largest power savings. In certain cases it has proved cheaper to give away hardware or even financing (such as paying the full costs of weatherization), rather than paying the administrative costs of running an efficiency program. To the extent that it is cheaper to save than to make electricity on the margin, gifts and grants increase utility profits.

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Box 3: Utility-Based Efficiency Programs

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■ ***Targeted mass retrofits***

An example of a targeted mass retrofit is a short-term, intensive program to re-equip commercial buildings with efficient lighting. This allows for buying equipment in bulk and realizes significant savings in the short term.

■ ***Third-party investor schemes***

An outside investor or energy service company contracts with an energy consumer to install energy-saving devices purchased by the investor. The return to the investor comes from the stream of energy savings.

Industry experts have proposed more advanced electricity efficiency programs, such as sliding-scale hook up fees for new buildings. Under this scheme, fees for hooking up new buildings to the electricity grid would be based on each building's electricity usage. Other possibilities include creating a market for buying and selling energy savings through the use of peak load covenants and wheelable savings.*

The potential for power companies to get involved in selling energy efficiency is tremendous. While some of the programs just outlined may not be easily transferred into a developing country setting, many are applicable. In addition, there may be options available in certain LDCs that would not be workable in the United States.

*Peak load covenants have been proposed in which the owner of a building or factory could sell the utility a binding covenant to the effect that it would never use more than a fixed amount of electricity. The utility could then resell the covenant to the secondary market. Wheelable savings schemes have also been proposed to encourage industrial customers to invest in savings elsewhere on the system, then buy back at an intermediate price the amount of electricity they save.¹

vides financial incentives for conservation through tax and tariff reductions and subsidized loans. Less market-oriented economies have also sought to use electricity more productively. For instance, China has made important initial strides in industrial energy conservation. Bonuses are given for consumption below electricity supply quotas as long as production levels are met. In addition, all state enterprises must install energy consumption metering equipment. Despite a few isolated examples, developing countries as a whole have yet to tap the significant financial savings available to them. Such attempts at energy efficiency need to be supported and expanded by the major international lending agencies.

Chapter Three

Energy Efficiency and the World Bank

Importance of the World Bank

Multilateral development banks have been instrumental in the expansion of power systems in the Third World. The World Bank, as the single largest financier of power projects in the developing world, is the most influential of these institutions. In addition to the large sums the World Bank has lent from its own finances, it has facilitated cofinancing arrangements in the form of additional lending from the regional development banks, bilateral sources, and the commercial banks. Because of its size and influence, the extent to which the World Bank supports efficient end use of electricity is crucial to the adoption of these lowest-cost technologies.

Trends in Lending to the Power Sector

The energy sector, and power generation in particular, has been the World Bank's bread and butter sector. The bank made its first power loan to Chile in 1948. Since then, over \$30 billion has been invested in almost 500 power projects in over 90 countries. This represents about 17 percent of total World Bank lending, making it the second most important sector after agriculture (see box 4).

In the past six years, there has been a shift in emphasis away from financing oil- and coal-fired thermal power plants and toward hydroelectricity as a result of the increased price of oil. At the same time, lending agencies have moved away from a strict focus on building power plants and distribution systems, and have begun to act on

Box 4: Breakdown of World Bank Lending to the Electricity Sector

In 1987, the World Bank lent about \$3 billion to the power sector. This includes projects in the power sector and what are termed power sector loans. This new style of lending is not necessarily targeted to particular projects, but a portion of the loan is put at the general disposal of a national power company if changes in certain policies, such as pricing, are implemented. Loans to the power sector have not risen as rapidly as those in other areas, most notably agriculture and nonproject loans.

A breakdown of energy lending in recent years by geographical region follows. Because power investments tend to be lumpy, however, averages of several years' lending give a more accurate indication of regional lending patterns. Between

*Figure 6: Cumulative World Bank Lending through 1987, by Sector**

<i>Sector</i>	<i>Million U.S. Dollars</i>
Agriculture	45,134.9
Energy	37,300.7
Oil, coal, gas power	7,077.4
	30,223.3
Transportation	28,640.9
Development finance corporations	15,084.5
Nonproject lending	14,401.8
Industry	9,859.9
Water supply and sewerage	8,481.1
Education	7,859.5
Urban development	6,423.7
Small-scale enterprise	3,801.8
Population, health, nutrition	1,585.4

*Includes IBRD and International Development Association loans.

Source: IBRD, *World Bank Annual Report*, 1987.

1983 and 1987, South Asia accounted for the largest share (37 percent) of power loans, followed by Latin America and the Caribbean (23 percent), East Asia and the Pacific (18 percent), Europe, the Middle East, and North Africa (15 percent), East and Southern Africa (5 percent), and West Africa (2 percent). This distribution reflects, in part, the demand for electricity in the various regions. For instance, with its low level of urbanization and depressed per capita income, Africa has yet to move into electricity-intensive activities, which explains the low level of commitment by the bank. These figures also tend to understate demand from those regions with access to commercial sources of finance, like Europe, the Middle East, and North Africa.

*Figure 7: World Bank Lending to the Energy Sector, by Region**

	Annual Average					
	1978-82	1983	1984	1985	1986	1987
South Asia						
Oil, coal, gas	144.8	478.3	498.0	591.0	—	548.0
Power	536.5	577.1	854.6	926.0	710.0	1312.0
EMENA†						
Oil, coal, gas	109.8	130.4	103.0	166.7	—	—
Power	180.6	318.6	308.7	267.0	505.2	527.0
Latin America and Caribbean						
Oil, coal, gas	82.6	81.2	—	310.0	131.0	104.4
Power	508.9	89.4	841.1	833.7	819.2	423.8
East Asia and Pacific						
Oil, coal, gas	100.2	339.7	159.4	236.0	97.0	—
Power	344.8	609.6	425.4	167.0	535.5	684.8
West Africa						
Oil, coal, gas	26.9	36.0	51.0	2.6	—	15.0
Power	58.9	24.0	30.0	15.5	48.0	6.3
East and Southern Africa						
Oil, coal, gas	16.8	26.0	53.0	25.1	3.1	20.0
Power	40.2	149.5	189.6	41.1	169.0	63.0
Totals						
Oil, coal, gas	481.1	1091.6	864.4	1331.4	231.1	687.4
Power	1669.9	1768.2	2649.4	2250.3	2786.9	3016.9

*In million U.S. dollars.

†Europe, Middle East, and North Africa.

Source: IBRD, *World Bank Annual Report*, 1987.

growing concerns about institutional development. Now, loan agreements often incorporate requirements to implement changes in management and organizational structure. In the same vein, public utilities have initiated significant training programs for their employees. In fact, by 1979 over 60 percent of all power loans included financing for training components, with these components accounting for 1.5 percent of total energy financing.²¹

The financial health of utilities has also been a major preoccupation of current World Bank power loans. In most cases, reform of the rate structure is considered mandatory. The bank uniformly supports electricity pricing equal to long-run marginal costs and peak load pricing where appropriate. Improved billing and collection procedures are also encouraged to enhance cash flow.

The trend toward encouraging institutional development and policy reform establishes an ideal framework for incorporating electricity efficiency programs into the bank's lending policies. In addition to directly financing energy-saving equipment, the bank can make the pricing, regulatory, and institutional changes needed to promote electricity efficiency savings as a component of its loans.

Current World Bank Activities in Energy Efficiency

The World Bank's stated policy in the energy sector is to finance the lowest-cost energy options which would minimize the total life-cycle costs to society. This has usually meant an evaluation of lowest-cost energy *supply* options. However, the World Bank has not entirely neglected the potential for efficiency improvements. Efficiency in the power sector can be improved in three areas: *production*, *distribution*, and *consumption*. World Bank efforts have concentrated on the first two areas. In most less-developed countries (LDCs), the most cost-effective way of increasing electricity supply is to improve the efficiency of existing facilities. Developing countries lose a large share (typically 30 to 50 percent) of generated electricity in the transmission and distribution process. In 1987, the bank approved seven power loans (to Argentina, China, India, Indonesia, Malaysia, Turkey, and Pakistan) in the amount of \$1.7 billion that had large

components promoting more efficient power production and distribution.

The World Bank's efforts to increase the efficiency of energy consumption have concentrated on the energy pricing structure. The bank has uniformly pushed for the establishment of electricity rates that reflect the long-run marginal cost of supply. While the impetus for this policy comes from the need to shore up the cash flow of embattled power companies, marginal cost pricing can be a significant inducement to more efficient energy use. Pricing energy below its marginal cost leads consumers to believe that electricity is cheaper than it really is, resulting in overconsumption. In fact, the World Bank considers correct pricing policy to be a precondition for effective strategies to manage demand.

In addition to changes in pricing policy, there have been scattered efforts to improve end-use efficiency. The group most directly involved in analyzing the potential of end-use efficiency is the Energy Sector Management Assistance Program (ESMAP). ESMAP was created in 1983 as a joint program of the United Nations Development Program (UNDP) and the World Bank to improve the energy planning and assessment process in member countries. ESMAP comprises two divisions of the bank's Industry and Energy Department: a) the Energy Efficiency and Strategy Unit, which is responsible for evaluating institutional, financial, and policy issues in the energy sector, including designing sector strategies, improving energy end use, defining investment programs, and strengthening sector enterprises; and b) the Household Energy Unit, which focuses on issues affecting energy demand and supply in lower-income rural and urban households as well as in rural industries.²² Bilateral donors have since joined in financing portions of ESMAP's work program.* Nonetheless, the bank's contribution to ESMAP in 1987 represented less than .06 percent of total World Bank lending in the energy sector.† ESMAP is also marginalized because it lies outside of the organizational

* In 1987, ESMAP received \$2.25 million from the World Bank, \$2.86 million from the UNDP, and \$4.32 million from bilateral sources.

† This figure in part reflects the limited nature of ESMAP's involvement in project lending. Most ESMAP efforts so far have focused on studies and assessments.

structure of the regional operational departments where the vast majority of World Bank projects are designed and implemented.

Despite the relatively modest institutional backing for end-use efficiency, a number of loans have been issued, primarily in the industrial sector. One type of loan, used in Yugoslavia, Hungary, and Tunisia, provides capital to local development banks which then offer loans to industry for improvements in energy efficiency. This "on-lending" provides loans to industry that would be too small to be administered cost-effectively by the World Bank. For instance, in 1987 a \$90 million loan to the Ljubljanska Banka in Yugoslavia was approved as a line of credit to finance energy subprojects to improve industrial competitiveness and decrease reliance on imports. In a similar project in Hungary, all the industries applying for a loan prepare a cost-benefit analysis of the proposed efficiency improvements. The Hungarian bank then ranks applications by energy savings per dollar invested.

Electricity efficiency outside of the industrial sector has received far less attention. An important exception to this is a recent \$650,000 technical assistance loan to Jamaica. The loan is intended to assist Jamaica in designing an energy efficient building code and beginning an appliance labeling program. All government buildings will follow this code on a one-year trial basis before it is made mandatory throughout the country. The appliance labeling program will establish test facilities for refrigerators, stoves, air conditioners, water heaters and electric motors. If this program is successful, a second phase would involve disseminating the approach throughout the Caribbean. Finally, a \$3 million loan to establish a revolving credit fund for commercial retrofits is under consideration.

ESMAP has also financed training and demonstration projects. Several types of loans have included components to train industrial and utility personnel to perform energy audits. Recently, ESMAP prepared a \$3 million industrial energy efficiency loan to Senegal that provided technical assistance to train authorities in energy conservation strategies. In 1987, a \$4 million loan was approved to assist the Tunisian Agency for Energy Conservation in developing energy efficiency demonstrations in 28 selected enterprises. Despite these promising initial efforts, the World Bank has yet to make the commitment to energy end-use efficiency warranted by its potential benefits.

Arguments Justifying Low Funding Levels

Despite the rule of thumb that it is cheaper to save electricity than to produce it, the vast majority of lending to the power sector is still being channeled into less productive supply expansions. By the World Bank's own estimate, \$56 billion to \$105 billion should have been invested from 1983-85 to achieve the potential energy savings from short- and medium-term measures in the industrial sector alone. Although exact figures are not available, it appears certain that actual investment has fallen far short of this target.

World Bank staff often put forth four arguments to justify the meager resources devoted to promoting energy efficiency: a) energy efficiency offers only marginal benefits at best, b) correcting the electricity pricing structure in developing countries is all that is required for an optimal level of energy consumption, c) power companies and energy ministries in the Third World lack sufficient technical and managerial skill to carry out demand management programs, and d) end-use efficient technologies are too expensive for developing countries. Although many accept these arguments at face value, their validity is questionable.

Are the Benefits of Energy Efficiency Marginal?

The claim that the effect of energy savings is marginal ignores not only the recent experience in countries of the Organization for Economic Cooperation and Development but also the very existence of remarkable technologies and processes that can save substantial amounts of energy and already in place. The World Bank itself has reported significant potential savings, particularly in the industrial sector, which accounts for the majority of electricity consumed in developing countries. These figures should be considered conservative, since the bank has not devoted the resources necessary to keep project staff abreast of rapid technological changes.*

* The World Bank itself launched an energy conservation program in 1983 for the nine buildings it occupies in Washington. Low-cost (or no-cost) housekeeping measures, a lighting retrofit, and a limited number of capital projects (interconnected boiler plant, chilled water risers, and variable speed drives) have saved over 20 percent

A related contention is that no matter how much energy is saved, new generating capacity will still be needed. However, because so much electricity is wasted in LDCs, a small investment in efficiency can yield big savings. Analysis has shown that the potential savings are so large that demand growth can feasibly be held to zero, or even be made negative. Therefore, by investing in the programs with the highest returns first, it may be possible to avoid constructing lower-return power plants, which take years to complete and tie up precious working capital. The long lead time of power plants is still not a reason to start building them today. Rather, plants that are going to monopolize a lot of capital for years before they become operational should be delayed in favor of short lead-time, fast pay-back options. In fact, this concept of speed is one of the primary reasons for the growing interest of U.S. utilities in efficiency. According to one industry expert, "Investing in efficiency minimizes regret."

As important as the exact amount of money to be saved is the impact of these potential savings on the national economy. The effect of reduced oil and coal imports, combined with the more competitive export status of more efficient industries, can make an immediate and significant contribution to the process of economic restructuring in the Third World. As the World Bank turns its attention to the debt problem, trade imbalances, and sluggish economic growth in developing countries, energy efficiency investments provide a rich opportunity for linking the project lending of the World Bank with these broader, macroeconomic concerns.

Is It Enough to Get the Price Right?

The most common argument against direct investment in energy efficiency projects is that if electricity tariffs are set equal to long-run marginal costs, the optimal level of energy consumption will automatically result. In this case, demand management is seen as residual of a well-functioning pricing system. However, market rigid-

of the bank's annual electricity bill. These measures have locked into place \$1.2 million in annual savings at a one-time cost of \$1.8 million. Cumulative avoided costs as of this writing amount to \$4.3 million, or a net savings of \$2.5 million. To twist the old adage, the bank should preach what it practices.

ities and imperfections explain why marginal-cost pricing may not lead to optimal energy use. In general, private citizens and firms have tended to under invest in electricity efficiency for reasons that go beyond where the price is set. These reasons only strengthen the case for World Bank involvement, particularly in the correction of these market imperfections that result in an inefficient allocation of resources.

One of the most important of the market rigidities has been the slow response of developing countries to energy price increases. This inability to react quickly to price changes has carried a significant penalty in terms of reduced industrial competitiveness and expensive trade imbalances. It is not clear that the developing world, noted for its inefficient markets in general, can afford to respond appropriately only after signals appear. There are still other market weaknesses:

- The lack of familiarity with efficient end-use devices slows adoption by nonspecialists.
- The plethora of energy-saving possibilities requires a greater knowledge base among decision makers than do equivalent supply technologies.*
- Those agents desiring to invest in end-use technologies (for example, industries and households) may face greater capital constraints in terms of access and price than national power companies face in expanding supply.
- The risks and uncertainties of unfamiliar technologies are often perceived to be greater than those of technologies in current use, despite clear economic benefits.
- Incentives for energy conservation may be split among various government agencies and among categories of users (for example, renters versus owners of commercial buildings).
- Power plants carry significant negative externalities in the form of environmental degradation which will not be reflected in the market price. If electricity were priced at its cost to society, the incentive to save energy would be even more overwhelming.

* In other words, energy efficiency improvements are information intensive, which is a disadvantage in developing countries where information flows are fragmented and more costly.

These market imperfections should not be viewed as reasons not to invest in energy savings. On the contrary, interventions beyond simply tinkering with electricity prices are required, not only to send the correct market signals, but also to provide the means for energy consumers to make the best choices. The World Bank can go a long way toward making energy markets function more efficiently by providing capital and information to fill in the gaps where energy markets are not presently performing well.

In addition to being a naively optimistic appraisal of the efficiency with which energy markets function, the "... get the prices right" argument overlooks the potential benefits energy efficiency can yield in markets plagued by inaccurate pricing signals. To say that energy efficiency is unimportant, or even misguided, in countries with distorted electricity rates misses a very fundamental point. In an environment where prices are not sufficient to cover the marginal costs of production, the incentive to save electricity shifts from the consumer to the producer. Since power companies lose money on each kilowatt they sell, they have a clear interest in providing energy services through selling efficiency rather than selling electricity. This should not be viewed as the acceptance *per se* of distorted energy pricing, but rather as a recognition that even the wholehearted support by the World Bank of marginal cost pricing has borne few results. Indeed, a survey by the World Bank revealed that, on average, national power companies need to increase their tariffs by 60 to 90 percent. Only 18 out of the 33 power companies surveyed had increased their power tariffs in real terms since 1974.²³ Since political and social objectives may preclude either shutting down the national power system or raising prices to an economic level, the best opportunity a national power company has to cut its losses is through financing efficiency improvements. Unfortunately, to date the World Bank has been extremely reluctant to require power utilities to promote end-use efficiency.

Are LDCs Capable of Managing Efficiency Programs?

World Bank staff argue that power companies in developing countries lack the human resources to implement ambitious conservation pro-

grams. Historically, however, public power companies have attracted higher-caliber technicians and managers than other ministries and public enterprises, with the possible exception of public oil companies. The bank itself has invested millions of dollars in the institutional development of these power companies. Clearly, the success of an energy conservation strategy will require competent managers and institutions. With technical assistance and training, these institutions should be able to tap into existing sources of information on end-use efficient technologies and programs, assisted by an evolving World Bank competence in these areas. The managerial competence argument is further weakened in light of the alternative presented by the bank: a twofold increase in installed generating capacity in developing countries by 1995. Implementing such an expansion would itself require a massive development of human resources.

Is More Efficient Technology Too Expensive for the Third World?

Some World Bank staff members argue that developing countries cannot afford expensive technology. While the initial cost of some of these technologies is high, quick, low-cost measures can provide substantial savings in all sectors before a country moves on to more capital-intensive investments. Moreover, the cash flow of more expensive investments in energy efficiency closely resembles that of a hydroelectric power plant, which has high capital costs and minimal operating costs. In advocating the construction of hydroelectric dams, the World Bank has accurately chosen to base energy investment decisions on life-cycle costs as opposed to capital costs. Efficiency investments should be assessed on the same basis. Numerous analyses have shown that on the basis of cost per kilowatt used to provide an energy service, efficiency is by far the cheapest option. The capital to finance this transition can come from money earmarked for future power supply projects that may become irrelevant, or more generally from a reorientation of the lending program of financial institutions like the World Bank.

By not facilitating the transfer of technology considered the best available based on cost and performance criteria; the World Bank opens itself to accusations of contributing to technology dumping in

the Third World. It would be a shame if technology suppliers from industrialized countries were able to use the World Bank as a conduit for selling off energy-guzzling motors and machines that have become obsolete because of high operating costs. The World Bank should work with developing countries to establish guidelines and standards relating to the efficiency of energy consuming imports.

Chapter Four

An Agenda for the Future

The keys to increasing energy efficiency in developing countries are fairly well recognized. Getting information and capital to end users, removing regulatory and policy barriers, and promoting innovation in end-use technologies are required. Because of its position as a clearinghouse of information and capital, the World Bank is uniquely positioned to implement these steps. An agenda for action by the World Bank should be based on the following elements:

- making energy efficiency a priority at the bank;
- providing capital to finance the transition to a more energy efficient future;
- disseminating information on energy efficiency among producers and policy makers in developing countries and incorporating energy efficiency into the bank's project analysis and sector work; and
- promoting innovation in energy efficiency in developing countries by building research capabilities and promoting private sector initiatives.

Making Energy Efficiency a Priority at the World Bank

Overall Policy Direction

Increasing end-use efficiency will require a change in the conventional World Bank thinking regarding its funding in the power sector. To effect this change, a strong policy needs to be formulated and

advocated at the highest levels of the bank. Statements by the president have often been used to set such policies. Robert McNamara's famous speech in Nairobi in 1974 provided the basic context of human needs that steered bank operations through much of the 1970s.

The current World Bank president, Barber Conable, has recently called for action in areas historically neglected in the bank's operations, like protecting the environment and addressing the unique role of women in the development process. However, the mandate to be more responsive to environmental concerns has yet to be translated into an operationally relevant framework. As project officers grapple with putting these principles into action, energy efficiency provides a ready vehicle for making concrete the bank's claim of environmental protection while addressing the bank's more immediate concern with shoring up the battered economies of the developing world.

Energy Efficiency within the Framework of Structural Adjustment

In recent years, the World Bank has taken a more strategic role in addressing the macroeconomic crisis in those developing countries plagued by chronic balance of payments deficits, inefficient public enterprises, distorted domestic prices, which discourage production, and heavy fiscal deficits. The idea of lending focused on structural adjustment was developed to assist these countries to realign domestic pricing structures, expand export production, and redirect public sector expenditure patterns.

Energy efficiency needs to be placed squarely within this macroeconomic dialogue. Analysis shows that less-developed countries (LDCs) can achieve a very significant and cost-effective reduction in energy imports with quite straightforward efficiency measures. Efficiency also contributes to making local manufacturing and agricultural production more competitive, which would further improve the trade balance through an increase in these exports.* Because

* Dr. Art Rosenfeld of the Lawrence Berkeley Laboratory has estimated that solely by using energy more efficiently, the Japanese enjoy a 5 percent cost advantage on

electricity is an important input in the production of goods and services, an increase in energy productivity would have significant ripple effects in the domestic economy. In market-based economies, a reduction in the cost of production tends to increase national output and decrease the rate of inflation by lowering prices. In contrast, a devaluation of the local currency, the current preferred tool of the International Monetary Fund and World Bank to spur economic growth, has an inflationary effect that has proved dangerous in countries prone to macroeconomic instability.

The World Bank has made some tentative steps toward recognizing the potential role of the energy sector in economic restructuring. Several structural adjustment loans (to South Korea, Turkey, and Guyana) have made changes in energy prices a condition of lending. The next step is to provide direct financing of efficiency improvements. In this sense, energy efficiency should be seen as a vehicle for structural adjustment, providing significant macroeconomic benefits. In addition, at a time when the social costs of the adjustment process are of increasing concern, gains in energy efficiency would improve the cash flow of financially strapped public utilities. This would allow an expansion of electricity service to disadvantaged areas or free up public resources to be used to stabilize social services to the most vulnerable segments of society.

Providing Capital to Finance Efficiency

One of the greatest challenges in encouraging an energy efficient future is creating mechanisms that provide capital to end users. The World Bank has two general types of loans in its portfolio: project loans, which are tied to specific investments in a given sector, such as building a power plant or road system, or establishing an agricultural extension service; and nonproject loans, such as structural adjustment loans, which provide general budgetary support under

exports over the United States.²⁴ Among developing countries, electricity consumption in kilowatt-hours per \$1,000 of output was seven times greater in South Korea's textile industry and five times greater in the Philippines' than the consumption rate in Japan in 1973.²⁵

the condition of certain policy changes. Sector adjustment loans are a hybrid of these two types of loans, whereby general financing is available to a sector ministry tied to certain policy changes at the sector level. All of these instruments can be used to finance energy conservation. Using these formats, capital can be channeled into six areas:

- Industrial and commercial retrofits and installations
- Projects involving public utilities
- On-lending through financial intermediaries
- Institutional development loans
- Policy-based lending
- Training and technical assistance.

Industrial and Commercial Retrofits and Installations

This type of project lending would involve direct investment in energy-saving devices and processes used by various industries and commercial establishments. Much in the way that the World Bank now finances rehabilitation and expansion of certain publicly owned industries, the bank can provide capital to a steel industry, for instance, for conversion to more efficient milling technologies. Within the commercial sector, projects should focus on savings in lighting and air conditioning. While improving one building would probably be too small an activity to justify a World Bank loan, outfitting most of the buildings in a city would be a scale more amenable to the bank's style of projects (see box 5).

Within the commercial and residential sector, one of the primary targets of project lending should be the public sector itself. Administrative buildings, public housing, military installations, schools, and hospitals represent a significant source of both energy savings and fiscal savings. These public buildings could be converted to more efficient lighting and cooling systems. Depending on a country's circumstances installing new technologies could be handled by the government energy ministry or public utilities, or contracted to private sector companies. This approach would create an initial market for efficient end-use technologies. More important, it would strengthen the experience and training of the agents who would then be involved

Box 5: Efficient Light Bulbs for Bombay¹

Although the industrial sector consumes the majority of electricity in developing countries, the potential for saving energy in the commercial and residential sectors is high. In addition to being a source of low-cost savings, residential and commercial programs tend to spread the benefits from savings over a wide segment of the population. A recent study carried out by the Tata Energy Research Institute (TERI) in India highlights the significant impact changing light bulbs can have on easing power supply constraints.

In South Bombay, electricity demand peaks between 5:00 P.M. and 10:00 P.M., when lights are turned on in residences and commercial establishments, particularly in the small shops that stay open into the evening hours. Load restrictions (between 10 percent and 50 percent of peak demand) take effect during these hours to reduce the surge of demand from the local electricity grid, which the power company cannot satisfy. The South Bombay power company is forced to make a choice between adding new capacity or controlling demand through efficiency measures. In the past, the addition of generating capacity in India has always fallen short of the targets set in the country's five-year plans because of constraints on financial and managerial resources required to build power plants and construction delays.

Since the greatest share of the peak load demand for power comes from lighting, TERI decided to see how much energy could be saved by using more efficient light bulbs, thereby avoiding the rate increases that tend to come with the amortization of capital-intensive power plants. Of the maximum lighting load peak at 7:00 P.M. of 11,472 megawatts, incandescent bulbs account for 63 and fluorescent bulbs for 37 percent. Incandescent bulbs, the least energy efficient source of lighting, are used extensively by the residential sector. TERI looked at two options for reducing peak demand:

(Continued)

Box 5: Efficient Light Bulbs for Bombay¹

(Continued from previous page)

- Use technologies available in India and replace all incandescent bulbs (average 65.5 watts) with 20-watt fluorescent lamps that give the same light as 100-watt incandescent bulbs.
- Replace incandescent bulbs with more efficient 10-watt fluorescent bulbs not currently produced in India, and assume that no import tariffs apply (imported light bulbs now face high tariffs designed to protect domestic producers). In other words, this option involves comparing the use of incandescent bulbs with the use of 10-watt fluorescent bulbs as if the fluorescent bulbs had been produced in India.

An economic analysis of these two options shows the attractiveness of saving rather than producing power.

Option A

If all incandescent bulbs were replaced with fluorescent bulbs, 4,167 megawatts of end-use (at the switch) electricity would be saved, which is equivalent to displacing 5,000 megawatts at the generation point (or 8,726 megawatts of installed capacity). This would shave about 40 percent off the current peak load in South Bombay, eliminating the need for load restrictions and delaying the need for new capacity. Comparing the cost of this conversion against the stream of energy savings, the rate of return on Option A would be 50 to 55 percent.

Option B

Replacing incandescent bulbs with the more expensive, but more efficient 10-watt fluorescents would displace even more energy demand, equivalent to saving 5,159 megawatts at the end-use point. The 44 percent rate of return on this option is still extremely attractive.

Implementing either option could be handled in a number of ways. TERI has outlined the following policy options, which could be easily tailored to World Bank-style loans:

Legislation

- Rebate residential and commercial building taxes if efficient light bulbs are installed.
- Leverage efficiency through regulations for government housing and housing loans.
- Change building codes to require at least one fluorescent bulb in each residential unit for building approval.
- Deregulate the licensing procedure for producing light bulbs locally.

Credit

- Allow local and state utilities to have lease-purchase arrangements, with payments automatically added to the electricity bills of the lessors.

Taxes

- Rework the existing excise duty structure, which discourages high-efficiency light bulbs.
- Reduce the high customs duty on efficient bulbs.

Education

- Mount consumer education campaigns.
- Establish a training program for policy makers, including local utility representatives, government officials, building inspectors, and others.

Organizational Support

- Establish a testing facility at the Indian Standards Institute to determine efficiency grades so that a tax structure can be set.

in more diffuse, society-wide efforts. In addition, these programs could be used to generate baseline data and test technologies.

Projects Involving Public Utilities

Historically, the World Bank has shied away from involving utilities in the implementation of end-use efficiency. However, the substantial benefits of conservation call this strategy into question. Utilities

enjoy certain advantages by becoming involved in selling energy savings. Since the business of utilities is energy, they are in a better position to evaluate technologies and perform energy audits than are financial intermediaries, public sector companies, or other potential investors in efficiency. Unlike banks and energy ministries, utilities already have an established financial relationship with electricity consumers. Not only do the power companies know who their customers are and how much electricity they use, they may be able to administer loan and rebate programs more cost effectively than banks by piggybacking these services onto existing billing procedures.*

Utilities must perceive that they have a stake in seeing energy used more efficiently. Energy conservation programs should be designed to bring noticeable benefits to utilities' cash flows, rather than simply multiply their responsibilities. Moreover, utilities should be rewarded for saving energy, not just spending money on efficiency programs.

Energy utilities in the countries of the Organization for Economic Cooperation and Development (OECD), particularly the United States, provide interesting examples of the type of arrangements that could be financed in developing countries. Some of these arrangements include grants, loans, and rebates to customers for the installation of energy efficient appliances and industrial technology. Other utilities have sponsored demonstration projects, energy awareness campaigns, and shared savings contracts (see box 3).

Although the transfer of a particular program, especially from the United States, to a developing country must be viewed with caution, clearly there is room for adaptation of some aspects of these strategies to many LDC power companies. At the very least, the World Bank should finance an initial investigation into the applicability to certain LDCs of such models as shared savings arrangements, variable payment loans, energy service agreements, and joint ventures with external investors.²⁷

* It has been argued that not only is it beneficial to the utilities to become involved in energy conservation, but efforts may not succeed without the active support of the utilities. For instance, Meier and Chatterjee report that in Sri Lanka, the focal point for the improved stove program is the planning department of the electric utility, is one of the few institutions that has both the managerial competence and the organizational capability in the field to implement such a program.²⁶

In countries with very weak managerial and physical infrastructure, there may be very high transaction costs in providing information about technologies and the financing to purchase them. In such cases, utility-directed programs to install conservation devices without charge may be worthwhile. Subcontracting through traditional equipment suppliers would help avoid disruption of these enterprises and familiarize suppliers with these new technologies. While the argument is often made that handing out free goods invites abuse, light bulbs are not very fungible. Whatever the eventual arrangement, the World Bank should make a top priority of more direct involvement by public utilities in encouraging and financing end-use efficiency.

On-Lending through Financial Intermediaries

Because loans under \$5 million are not truly cost-effective for the World Bank to administer, mechanisms for passing money on to smaller borrowers must be created. The World Bank is already using local development banks to provide industrial energy efficiency loans. The World Bank's preference for market interest rates where applicable helps ensure the sustainability of these funds. So far, on-lending programs have been largely confined to industrial loans in countries with more sophisticated banking systems. These loans should also be expanded to include the commercial sector.

In the residential sector, small loans to households have historically been difficult for large international lending agencies to administer. In many developing countries, consumer credit is largely available only through informal credit markets, which have much higher interest rates than commercial banks. National development banks are often restricted to lending for "productive investments." Loans for conversion to more efficient appliances, for example, would not qualify. Through its lending operations, the World Bank can exert a certain policy influence over those financial intermediaries which it capitalizes. The bank could press for consideration of residential energy conservation loans as furthering national development objectives. This is particularly justifiable in countries where residential electricity consumption represents a large share of total consumption.

Institutional Development Loans

Institutional development is a generic term used to denote investments and policy changes that allow a public institution to more effectively deliver its particular services. In the context of energy conservation, institutional development could include the following components:

- designating and staffing specific units within energy ministries and public power companies to be responsible for implementing and monitoring end-use efficiency strategies;
- facilitating the transfer of budgetary resources and personnel to accomplish this goal;
- creating links with external institutions and research organizations that can act as sources of information and training;
- establishing management information systems to facilitate planning and implementation;
- creating national commissions for energy efficiency with representatives of the government, private industry, and consumers; and
- financing seminars and training courses for public sector technicians and managers.

Policy-Based Lending

The gradual shift from "hardware" loans, which emphasize construction of power stations, to multicomponent sector adjustment loans designed to encourage policy reform, is perfectly suited to promoting end-use efficiency. Stipulations can be built into these loans to correct market imperfections, create economic incentives, inform and protect consumers, and establish efficiency targets. These measures should be carried out within the context of the broader macroeconomic and financial reforms being facilitated by the World Bank.

There are many options for creating market-based incentives to use electricity more productively. Many of the most efficient technologies must be imported and therefore can face high tariffs. These tariffs have been used to protect domestic industries and to raise revenues, unfortunately at a high cost to consumers and a loss of

innovation. There is a tendency to continue to use outmoded equipment rather than purchase energy-saving devices that appear more expensive because of the import tariff. Lending contingent on reconsideration of policies affecting the energy sector should encourage LDCs to restructure tariffs, taking into account the benefits to the national economy that derive from importing energy-saving equipment. The present use of structural adjustment loans to facilitate liberalization of imports should be reviewed so that these technologies are included.

In many countries, economic incentives have been built into the tax structure. However, tax structures are very fragile in most LDCs. The World Bank has been financing tax reform to broaden tax bases and simplify procedures. Further modifications, particularly ones that make the code more complex, such as investment tax credits, would undoubtedly be met with resistance. Proposals to exempt energy-efficient technologies from sales tax would also raise concerns for the impact on already strained budgets. However, taxes that tend to stifle investment in technological innovation should be reviewed for their overall effect on the economy.

Policy-based lending can also facilitate regulatory changes. The capital provided through sector adjustment loans or direct technical assistance packages can finance the analysis and testing required to establish energy-efficient building codes and equipment standards. Sliding-scale hook up fees for commercial buildings is another interesting possibility. The government can also draft laws that require a greater integration of the demand side in energy planning and rework industrial regulations to make firms conform to efficiency standards.

On a national level, targets should be established for decreased energy use per unit of production, leaving it up to the implementing agency to decide on the type of technology and method of implementation. To provide the basis for establishing such targets, officials must develop a data base that gives cross-country comparisons of energy intensity of various economic activities. Monitoring and evaluation procedures should be established to track performance. This approach is not radically different from conditions now placed on energy sector loans. Targets for transmission and distribution losses, percentage of billings collected, and indicators of institutional development are routinely established.

Training and Technical Assistance

Human resources must be developed to effect the transition to greater energy efficiency. Since power loans have historically included large training components, there should be little resistance to financing the training required to maximize energy productivity. The objective of training should be to transfer expertise in all aspects of energy conservation to those responsible for implementing this approach in developing countries.

In addition to training components financed directly by energy loans, the World Bank's training facility, the Economic Development Institute (EDI), can play a significant role. EDI has conducted seminars on the power sector in the past. These seminars have been held in developing countries (India, Ivory Coast, Turkey, and Brazil), often in conjunction with universities and research centers from developed countries. EDI would be a valuable mechanism for information transfer, particularly important given the disparity between the North and the South in terms of knowledge about potential energy savings.

Technical assistance is another avenue for project lending. At present, consultants are used extensively in project preparation and training. Consulting firms with experience only in building power supply systems may be incapable of providing the most up-to-date information about end-use technologies. To provide institutional support on the World Bank side, a list of consultants able to carry out end-use analysis and training of LDC personnel is essential.

Technical assistance would facilitate the translation into an LDC context of much of the recent experience with energy efficiency in industrialized countries. This principle was used to advantage in rewriting building codes and establishing appliance labeling in Jamaica. Technical assistance could also be used to establish lines of communication among research facilities in different parts of the world. This will be particularly important to the process of adapting technologies to specific conditions in developing countries.

Disseminating Information

Lack of information about energy efficiency technologies and strategies is perhaps the single largest obstacle to their successful adop-

tion. This lack of information is apparent both within developing countries and within the World Bank itself.

Information Generation within the World Bank

For the World Bank to facilitate the flow of information to LDCs, it must generate data and analysis within its own institution. Although recent studies of the potential for increasing energy efficiency in selected industries have been helpful, this information has yet to percolate into the bank's operational divisions. For the World Bank to become a center of technical expertise in energy efficiency in developing countries, as it has in agricultural development, educational reform, housing finance, and other sectors, it must establish a sound analytical basis.* The main avenues for this information generation include data collection, project analysis, and sector work.

Data Collection

One of the current obstacles to designing effective conservation interventions is the dearth of information available on energy end use. While the Energy Sector Management Assistance Program (ESMAP) team has generated very useful data on the energy sector through its energy assessment program, the data are not disaggregated by end use sufficiently to develop solid strategies in energy conservation. More useful data would include: a) end uses broken down not only by sector but by task (that is, low-grade heat, shaft power, lighting, cooling, mechanical work, and so on), b) growth rates in energy consumption by end use, and c) energy intensity per unit of output for selected industries.

* The Technical Departments attached to each of the four regions (Africa, Latin America-Caribbean, Asia, and Europe-Middle East-North Africa) would be ideal institutional homes for creating a critical mass of expertise related to energy efficiency. These Technical Departments were created in the 1986 bank reorganization to serve as centers of technical excellence in each of the major sectors (energy and industry, agriculture, human resources, infrastructure, and trade and finance). Although each department devoted to a country or group of countries has divisions to oversee the various sectors, these divisions are staffed largely by economists and financial analysts. Ideally, these personnel should be able to receive technical advice by consulting with the Technical Departments.

This data base should be managed by a central division. Because ESMAP has ties with regional lending operations, its mandate should be expanded to incorporate the function of data collection and analysis. A very similar data base is being developed with United Nations Development Programme participation in the water supply and sewerage division of the World Bank, where indicators of efficiency of technology and service delivery are being developed across a wide range of countries. Not only do such data assist in formulating country strategies, they also allow for the development of world-wide standards against which a given country's performance can be monitored.

Incorporating Energy Efficiency into Project Analysis

Making efficiency a priority will require a World Bank-wide policy to review the potential for greater application of efficient end-use technologies in all of its lending operations. The project appraisal process is the appropriate stage in the project cycle in which to incorporate this assessment. Guidelines should be established in reviewing projects that entail consumption of significant amounts of energy, including irrigation, industrial development, infrastructure and so forth.* For instance, evaluators of a fertilizer plant should consider energy efficiency along with the other economic and technological attributes of the facility. Where the analysis points to processes and facilities that will greatly expand energy demand within a country, options for more efficient end-use technologies should be evaluated. This will be important since most countries face capital and environmental constraints on further expansions of power supply.

World Bank policy should reflect a commitment to lowest-cost provision of energy services, not simply energy supply. At present, energy analysts at the bank develop screening curves which give annual costs of competing electricity generating alternatives under various capacity assumptions. This analysis does not focus on pro-

* To institutionalize this review process, ESMAP should be charged with drawing up a list of those sectors and industries in which projects should include an energy impact statement. This will mitigate the added bureaucratic burden on projects where the marginal energy consumption is negligible, such as agricultural research and extension or educational reform.

viding a required level of energy services, such as for lighting, air conditioning, and motor power, but rather on establishing a given level of power capacity. Therefore, options that would provide the same level of services using less energy do not enter the analysis. A different type of analysis is necessary to integrate options for saving and generating electricity (see box 6).

The cost per kilowatt of providing energy services through power supply projects should be compared to the cost of providing the same services through demand-side efficiency improvements. The resulting screening curve would more accurately reflect the energy options facing a given country. While these demand measures usually incorporate a variety of approaches and technologies, global rules of thumb, which can certainly guide the cost-benefit analysis, are beginning to be developed. Under such a system, power supply projects would have to prove that they can deliver energy services at prices competitive with conservation options.

Sector Work

Sector work performed by the operational divisions of the World Bank provides an ideal vehicle for developing country-specific data and policy recommendations.* Sector work allows for more detailed research than does loan preparation and can be the first step in generating end-use data essential to policy formulation. At present, most of the sector work on energy has dealt with defining overall sector strategies. These strategies should ideally integrate demand and supply. To date there has been little attempt to determine the impact of vigorously pursuing demand management on the financial attractiveness of proposed supply expansion.

Public sector investment reviews (PSIRs) have grown in importance among the World Bank's sector work tasks. In this exercise, staff review a public investment program on the macroeconomic, sector and project levels. Within the energy sector this entails screen-

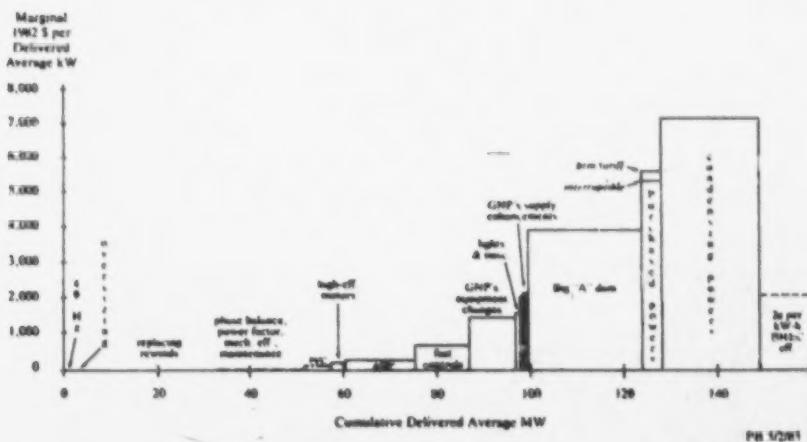
* In the World Bank's terminology, sector work denotes studies that serve to frame sector strategies in order to give advice to a country and to set priorities for bank lending. This is the strategic planning arm of the project preparation process. Sector work is also used to deepen the level of analysis in specific sector issues, like energy pricing.

Box 6: Building a Supply Curve for Energy Savings¹

In choosing the lowest-cost options for delivering energy services, the costs of generating electricity need to be compared to the costs of saving electricity. The methodology for this comparison is fairly straightforward. It consists of building an energy service supply curve that includes the marginal cost of various ways of saving power. This type of analysis provides a general guideline for electing the cheapest options first.

The electric supply curve (figure 8) was developed in 1985 by the Rocky Mountain Institute to demonstrate the cost effectiveness of saving energy in a pulp-and-paper mill in the state of Maine as compared to pursuing alternative supply options, including a) the construction of the Big "A" hydroelectric dam, b) output from the mill's oil-fired power plant (denoted by "Condensing power" in the graph), and c) purchasing oil-fired power from another producer. Although the analysis was carried out for Maine, similar mills are found in

Figure 8: Maximum Value of Power Savings, Great Northern Paper Co.



*Expressed as equivalent capital cost for a dam that provides the same power, financed under the same assumptions as the Big "A" dam.

Source: Rocky Mountain Institute, *Negawatts for Arkansas*, 1983.

many developing countries. The researchers examined the following ways to improve motors and drive systems in the mill: a) replacement of suboptimally wound 40-hertz motors, b) use of high-efficiency motors, c) correction of oversizing and rewind losses, d) use of adjustable-speed drives, e) use of power-factor controllers and soft start devices, f) use of fast controllers for turbo machinery, g) improvements in maintenance and drivetrain, and h) better correction of individual motors' phase imbalance and power factor.

To calculate the cost of saved energy, the annual investment (in dollars per year) is divided by the annual energy saved (in kilowatt hours per year). The figure for annual investment is determined by the price of equipment, estimated lifetime, and a discount factor (in this case 5 percent real). The supply curve shows a rectangle for each measure, starting with the lowest-cost measure. The width of each rectangle represents the total potential savings if that measure were adopted.

As the curve shows, energy efficiency improvements are cheaper and deliver a significant amount of saved power. In fact, savings from efficiency gains would be between 120 percent in the minimum case (not shown) and 240 percent in the maximum case (shown) of the savings yielded if output of the mill's oil-fired plant plus that of oil-fired purchased power were used. Even in the minimum savings case, efficiency improvements would displace the Big "A" dam at less than half the cost per kilowatt-hour. Improvements in industrial motors and processes since this 1985 analysis could deliver even greater savings at lower cost.

The World Bank's screening curve analysis tends to include only supply options like dams and power plants. By omitting energy savings, the lower cost portion of the curve just examined is never considered.

ing planned investments for their economic merit, relative importance, and compatibility with sector objectives. Under present fiscal constraints in most developing countries, PSIRs typically offer recommendations for cutting or postponing public investments. Because increasing the efficiency of energy end use reduces the need for costly supply expansions, a review of public investments should particularly scrutinize power expansion plans. Taking end-use efficiency into consideration when analyzing a public investment program can uncover large potential fiscal savings. In addition, PSIRs are the primary vehicle the bank uses for integrating analysis of specific projects with an assessment of macroeconomic indicators such as the size of the national budget, GNP growth, the inflation rate, and the like. This provides a format to explore the impact on the national economy of using energy more efficiently.

Information Flows within Member Countries

With better in-house expertise, the World Bank will be able to funnel information to developing countries. The bank can use its lending program to stimulate the flow of information to end-users within LDCs. Such activities include financing anything from a single energy awareness campaign to a full-fledged energy extension service. The bank has already begun to fund some of these activities, such as energy audit programs. It should now appraise the possibility of merging many of the existing efforts into an energy extension service.

The extension service model is well established within the World Bank. The bank has been instrumental in establishing agricultural extension services in many LDCs. Much as in the case of an energy extension service, the goal is to transfer agricultural technologies largely developed elsewhere to dispersed producers to raise productivity. Extension packages can include information, capital, technologies, and management advice. The training and visit (T&V) system used in agriculture is one model commonly used to reach farmers and modify farming practices. The T&V system is particularly good at providing clear and useful advice to farmers, leveraging information flow through contact farmers, and maintaining communication among field workers and researchers. An important aspect of agricultural extension is its ability to provide up-to-date and appropriate technical information. Accomplishing this depends on close

links with national and international research institutions. Recognizing this, the World Bank routinely funds research and extension as a package.

An extension service for energy could build on this experience. In the power sector, this service would be relatively cheap to administer because of concentration of electricity consumers. Moreover, the fact that electricity consumers are largely literate urban dwellers with relatively high incomes would make it easier to modify patterns of usage. Energy extension services could initially target the most intensive users of energy, such as certain manufacturing facilities, large commercial buildings, and big irrigation schemes. Like agricultural extension, energy extension services should provide a number of inputs, including an audit function, up-to-date information on local performance of various technologies, and information on credit programs and equipment supply sources. Repeated contacts with consumers would ensure the continued adoption of the most recent technologies, which is not the case with one-shot energy awareness campaigns.

Given the fast pace of recent technological innovations in energy conservation, an extension service would need to have close contacts with research organizations. Conversely, getting feedback from commercial, residential and industrial clients would assist the government in setting research priorities. National power companies could serve as the base for such operations. These companies have a stake in closer relations with their customers and already have devoted significant resources to personal contacts with consumers through installing and repairing power hook ups.

Promoting Innovation

Innovations in energy efficiency originating in developing countries are rare, and very little research has been done to adapt technologies developed in industrial countries to the conditions of LDCs. The authors of a study of the World Bank's role as a technological institution pointed out:

The diffusion of technology among developing countries has attracted much attention, and the bank is in a good position to act as a broker in the technology market, especially

in the transfer of technologies from one developing country to another. But the problem here is a basic one: in many cases, there is little new technology in the developing countries themselves.²⁸

This lack of innovation is of particular concern in the energy sector. The most energy-intensive industries happen to be those that are growing most quickly in developing countries: cement, steel, chemicals, glass, and fertilizer. The industrialized countries are shifting away from reliance on these industries toward a high-technology and service-oriented economy. Therefore, domestic demand in the OECD economies for these basic materials industries is not sufficient to encourage significant research in precisely those countries with the strongest research capabilities. Indigenous LDC research into energy efficiency improvements in the basic industries should be a priority for the World Bank.

Establishing a Research System

The World Bank's broad commitment to building local research capabilities should be extended more forcefully to the energy sector. This research should be geared to fulfilling the bank's four stated technological objectives:

- To ensure that the most appropriate technology is used in World Bank-financed projects
- To promote the development of technological capacity in LDCs
- To promote the generation, diffusion and application of innovative technologies
- To promote the adoption of national policies to foster local technological capacity.²⁹

Although in practice the World Bank is less inclined to fund basic research or test untried technologies, there is much precedence for its involvement. The World Bank serves as the coordinating body for the Consultative Group on International Agricultural Research (CGIAR).^{*} Efforts to duplicate the CGIAR model in other sectors

^{*} CGIAR funds 13 centers to conduct research to improve agricultural productivity. Launched with funding from international foundations in the 1950s and 1960s, these

have thus far met with little success. Most of the other sectors have lacked as urgent a mandate as food production in the 1960s and 1970s. Moreover, the multilateral development banks became involved only after foundation funding of much of the basic research had borne results. Although the CGIAR model might not apply directly to energy innovations, it is useful in thinking about how to support research and innovation in LDCs.

The World Bank is currently financing a number of research efforts that provide a more transferable model for expanding research in energy efficiency. The bank usually supports the use of innovative technologies through inclusion of research components, pilot projects and engineering studies in projects it finances. Within the industrial sector, recent World Bank-financed projects of interest include:

- An "innovation fund" within the Korea Electronics Institute for export-oriented research
- A loan to Israel's Office of the Chief Scientist for research into technology-intensive exports
- A Technology Improvement Fund in Turkey to support technology adjustment and upgrading of research and development activities of textile firms.

The World Bank should set a research agenda in energy efficiency, whether based on a global research system akin to the CGIAR or focused on more discrete project-based interventions. This research should include innovation as well as adaptation of existing technologies to the conditions and resources of developing countries.

Supporting Private Sector Initiatives

The bulk of the conversion to more efficient end-use technologies will in all likelihood be carried out through private sector channels. The World Bank can best support the private sector by providing information, creating a better incentive structure, and stimulating private demand through direct public investments. Adoption of many

centers were instrumental in the creation of the Green Revolution. The World Bank chairs meetings, raises funds from bilateral and multilateral donors, and provides logistical and administrative support.

of the strategies outlined in this book would create an incentive to local manufacturers to produce more efficient equipment and appliances.

The World Bank can finance private sector activities more directly through its affiliate, the International Finance Corporation (IFC). While most World Bank loans require a government guarantee and are directed to government agencies, the IFC is restricted to direct debt or equity investments in private enterprises. To date, IFC involvement in the energy sector has been limited to equity positions in oil and gas exploration and refining. Among its investments in industry there have undoubtedly been instances in which this capital was used to modernize equipment. However, the potential for energy savings is not evaluated in any systematic way and the IFC does not perform technical analyses of energy conservation strategies *per se*.

The IFC should be encouraged to finance energy conservation. First, the IFC should review the industrial projects it finances for the energy used per unit of output, much as the bank should analyze its public sector projects. The Industry and Energy Department at the World Bank can provide guidelines and international norms to be applied by IFC project officers. The IFC can also take equity positions in firms that manufacture energy-efficient appliances and equipment, from low-energy light bulbs and refrigerators to automobiles. The IFC can provide the capital necessary for these businesses to adapt their operations to situations in developing countries or it can provide start-up capital for new enterprises. It is conceivable that the IFC could become a third-party investor in energy conservation through either shared savings arrangements or joint venture agreements. In either case, the IFC would invest in energy-saving equipment in a given industry or commercial enterprise and receive its return out of the cash flow generated by the electricity savings.* This could be done directly or through a local firm financed by the IFC.

* In countries where private firms have limited access to foreign exchange, the payment of dividends issued in hard currency to the IFC could be a constraint on IFC financing. This is because, unlike export-oriented industries, energy savings do not generate foreign exchange directly. However, energy savings displaces current energy imports, thereby saving foreign exchange. Arrangements should be made with governments to recognize this foreign exchange savings, so that enterprises that displace imports are able to pay dividends appropriate for foreign investors.

Overcoming Institutional Constraints at the World Bank

Implementing an electricity conservation program requires overcoming a number of institutional constraints within the World Bank. These barriers include a psychological and organizational rift between concerns about energy supply and energy demand, the lack of a standard energy efficiency package that can be applied across all countries, and institutional incentives that favor large power loans.

The historical divide between the supply and demand sides of the energy equation has made coordination difficult. For instance, projected power savings from efficiency improvements are never fed back into supply-side planning. A concrete example of this schism is the situation in which the World Bank makes an industrial loan to reduce energy use and an energy loan for building power plants to deliver electricity to the industries trying to save energy. The recent reorganization of the World Bank, which merged energy and industrial lending into a single division, should aid coordination. However, one should not underestimate the significant psychological component of this problem. The goal of energy systems must be seen as delivering energy services, not simply providing power. Until using efficient end-use technologies is seen as a way of *supplying* energy services, energy conservation will continue to be underappreciated. Project officers have not viewed energy lending in these terms before.

Because there may be more actors involved and a greater combination of approaches, preparing an energy efficiency loan appears much more complex than ordering another power plant. However, there is a steep learning curve in developing these new loans, as

shown in the Jamaican program for modifying building codes and appliance labeling, which the World Bank is considering initiating in other Caribbean countries. All innovative lending mechanisms consume a great deal of bank staff time during their initial packaging. However, there is no indication that energy efficiency loans cannot become as commonplace and easy to administer as loans in other sectors that were originally viewed with the same skepticism.

The bank successfully packages power supply expansion loans and will be reluctant to reduce its portfolio in an area where loans are large and relatively easy to put together. The "live by lending" credo of the World Bank project officer may be endangered by the potential cancellation of planned power expansions in the face of lower-cost improvements in energy productivity. While this might appear to eventually threaten the organizational interests of some World Bank staff, the current inability of borrowers to provide domestic counterpart financing already brings into question the feasibility of large-scale power loans. More important, devising mechanisms to transfer resources in support of electricity efficiency creates new opportunities in project lending. If project officers begin to see the benefits of expanding into this new area of lending, and if the bureaucracy rewards such efforts, the technical difficulties of packaging new types of energy loans will be easily surmounted.

Conclusion

In a world where many proposals to protect the environment carry trade-offs in terms of forgone economic growth, financing increased energy efficiency is a no-lose alternative. Stopping the construction of a dam because it would destroy large tracts of a rain forest, or decommissioning a coal-fired plant because it contributes to the greenhouse effect will have a serious economic impact if such actions mean that factories are forced to close or people go without light. On the other hand, using electricity more productively satisfies the demand for energy services while making obsolete the demand for that new dam or power plant. The fact that energy efficiency is also the wisest investment under the strictest of economic criteria addresses the legitimate concern of institutions like the World Bank that they promote economic growth in the Third World. Indeed, because of the severe capital constraints on building large-scale power plants, *not* investing in raising energy productivity condemns these countries to a power-induced drag on economic expansion.

The World Bank has an international responsibility to promote the economic well-being of the poorest countries in the world. This entails financing loans that serve the best interests of its client nations. By making energy efficiency a priority of the lending program, the World Bank will be helping developing countries lower their electricity bills, make industries more competitive, and reduce households' monthly outlay for energy. Because of the fast payback of efficiency investments, the country itself will be in a better position to repay these and other loans.

To implement this agenda, the World Bank must move forward on several fronts. This book has proposed a strategy based on the following actions:

- Gearing up the analytical capabilities of the World Bank to more accurately appraise options in the energy sector;
- Creating mechanisms to pass capital to consumers, industries, and, most important, power companies, to enable these actors to make the appropriate investments;
- Disseminating accurate, up-to-date information so that purchasers and policy makers in developing countries can make informed choices; and
- Supporting research and development efforts to enable developing countries to take advantage of the rapid improvement of energy-saving technologies, as well as to develop new technologies more suited to the conditions and opportunities present in LDCs.

The challenge to the World Bank in the coming years will be to devise a lending program that capitalizes on the ample opportunities to reap the benefits of more productive use of energy. However, these enormous potential benefits will fail to materialize if the World Bank as an institution is incapable of adapting to these opportunities. By using its comparative advantage as the world's most influential provider of capital and information to developing countries, the bank stands poised to make a substantial improvement in the economy and natural environment of the developing world.

Mr. TRAIN. The emergence of international environmental issues on the world political scene has rather dramatically changed the scale on which we must follow Rene Dubos's famous adage, "Think globally, act locally."

Two local matters to which Congress must attend over the next 18 months if the United States is to retain its credibility as a leader in international environmental matters are the reauthorization of the Clean Air Act and instituting a concerted bipartisan process that aims to develop an environmentally sound, long-term national energy policy by December 1992. It is no longer possible to think of national or international environmental policy without thinking in the same instant of national and international energy policies. The two are linked at every turn from the debate over drilling in the Arctic National Wildlife Refuge to the overwhelming challenge of global warming.

As a first step, the 101st Congress and the administration should begin to develop and environmentally sound national energy policy, one which can also serve as a model for other nations.

Finally, I think it is appropriate to address the current national and international concern raised by the recent oilspill in Alaska and to recommend two cooperative ways for the United States to

demonstrate international leadership in halting further pollution of the marine environment.

Two treaties require the attention of this committee. The first would establish an international compensation regime to pay clean-up costs, provide funds to restore the marine environment and

compensate innocent parties who suffered damage from oilspills. These are the 1984 protocols that amend the 1969 Civil Liability Convention and the 1971 International Fund Convention. I'm aware that this has been before the committee for some time, and it does present some problems in the Congress. But I think the time has come and probably will never be more appropriate than now for action.

The second gap in this regard is the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, the first multilateral treaty in history that comprehensively addresses standards and qualifications for ships' crews.

I mention these, Mr. Chairman, not only because of my general concern for environmental matters, but I might also point out I am the U.S. vice president of an organization called the Advisory Committee on Pollution of the Seas, ACOPS, which is an advisory body to IMO, the Intergovernmental Maritime Organization.

Thank you for inviting me to testify, Mr. Chairman. I'll be happy to try to answer any questions the committee may have.

[The prepared statement of Mr. Train follows:]

PREPARED STATEMENT OF RUSSELL E. TRAIN

Mr. Chairman, distinguished Members of the Committee, thank you for this opportunity to present my views on international environmental priorities for the 101st Congress.

Planet Earth faces a daunting array of environmental and natural resource problems, the solutions to which require major, long-term commitments on the part of the United States and, indeed, on the part of the entire community of nations. The Congress and this Committee have crucial roles to play if we are to meet these commitments. Of course, the emphasis I urge on international environmental problems is not intended in any way to divert attention or funds from domestic environmental needs. The most important contribution any nation can make to solving global environmental problems is to put and keep its own environmental house in order. The Alaskan oil spill disaster lends tragic emphasis to this point.

Let me state at the outset -- as I have in previous

appearances before this Committee -- that, in my opinion, global environmental problems inevitably will become the principal focus of international affairs. The single overriding long-term issue facing the world community is how to achieve and maintain a sustainable balance between growing human populations and the natural systems of the earth upon which all life and all human activity depends.

If you travel as frequently as I do among the Third World countries of Central and South America, Africa, and Asia, it is hard to escape the conclusion that the imbalance between human populations and their resource base is growing greater all the time. Rampant deforestation, eroding soils, spreading deserts, loss of biological diversity including the destruction of fisheries, and polluted and degraded urban environments, combined with rapid population growth, present a picture of spreading environmental impoverishment, particularly in the tropics where the preponderance of human population growth is taking place. This bodes ill for the human future. We are seriously stressing the global environment today and the situation is going to get a lot worse. It is important to recognize that environmental degradation and human poverty are closely linked. Impoverished people desperate for land on which to grow crops or graze cattle and desperate for firewood are destroying forests and overgrazing ever more marginal land. Thus the poor are trapped in a vicious downward spiral. Their very survival leaves them no alternative but to overexploit the resources available to them. At the same time, the resultant environmental abuse means those same resources are diminishing in productivity. Throughout the Third World alarming amounts of land are actually going out of productive use. Add to this equation the fact of rapid population growth in these areas, particularly among the poor, and the situation is stark indeed. I do not present this gloomy picture in order to be discouraging but rather to emphasize the urgency of addressing environmental problems now.

What international environmental priorities can this Congress address, and how, specifically, can it address them?

By my reckoning, the 101st Congress has about 18 months to go. I am assuming that you take the traditional recesses. And I presume I am safe in assuming that you will adjourn sometime prior to the 1990 elections.

That doesn't leave much time.

What can Congress do for the international environment that we can look back on 18 months from now and say: this Congress made a difference?

I have a list of ten specific proposals. The list by no means exhausts the full range of global environmental issues or the remedies Congress might contemplate. It is a practical, workable set of concrete actions which might be regarded as a litmus test for the 101st Congress. Together, these items form an congressional agenda which, if worked through over the next 18 months, will provide a springboard for the environmental work ahead of Congress, the Executive Branch, and the world community in the 1990s.

The International Legal Framework for the Environment

We have seen abundant evidence in the past year that the environment is moving higher on the global agenda. Among the developments have been:

- o the communique of last June's Toronto Economic Summit;
- o the significant environmental reforms instituted by the World Bank;
- o the European Economic Community's decision to eliminate CFC's by the year 2000 and the United States' pledge to accelerate the phase-out;
- o the recent London conference on the ozone layer initiated by Prime Minister Margaret Thatcher and the growing list of countries ratifying the Montreal Protocol;
- o the recent meeting of 24 nations at The Hague which called for increased authority in the United Nations to deal with global climate issues;
- o the growing attention given environmental issues by national leaders around the world;
- o the growing strength of the "green" movement in Europe; and,
- o the constant attention being given to the environment by the media.

As international environmental issues have moved higher on the global agenda, so have they here at home. President Bush's emphasis on global environmental issues during the presidential campaign and in statements during the first weeks of his Administration have also provided welcome evidence that the United States is ready to renew its leadership in this area. Secretary of State Baker, during his confirmation hearings before this committee, made clear that global environmental issues are

high on the foreign policy agenda of the new Administration. Environmental Protection Agency Administrator William Reilly, until recently president of World Wildlife Fund and The Conservation Foundation, has made clear that he gives a very high priority to international environmental issues, and participated prominently in the recent London conference on the ozone layer. I must also point out that World Wildlife Fund in the United States has over 600,000 members and that this number continues to grow at a healthy rate. I can only conclude that this strong growth reflects the rapidly growing interest of the American people in international environmental issues

All of this interest has inspired discussion of new international treaties and conventions to deal with such topics as global warming, deforestation, and the loss of biological diversity, hazardous waste management, and other issues.

These are extremely encouraging developments. The international legal framework for environmental matters has evolved slowly over the past 30 years, and remains relatively fragile and threadbare compared to the scope of global environmental problems. (In reference to the slowness with which these matters tend to evolve, it is instructive to note that it was in 1974, when I was EPA Administrator, that we first publicly identified the damaging effect of CFCs on the ozone layer; and it was not until 14 years later that the producing nations agreed at Montreal to begin to limit CFC production.) The legal framework for dealing with international environmental issues must be extended and reinforced over the next decade--and I am confident it will be. I think it is safe to predict that the treaties, conventions, and bilateral agreements pertaining to environment and natural resources will undergo profound change between now and the end of the century.

World Wildlife Fund and The Conservation Foundation will play an active role in the development and implementation of these emerging instruments of international environmental law, as we have for decades. Let me sketch our involvement, if I may, then share an important lesson we have drawn from it. The WWF family worked hard for the passage of the Montreal Protocol on control of CFC's; now we are proud to have as a Senior Fellow at WWF and CF, Ambassador Richard E. Benedick, the chief U.S. negotiator of that landmark agreement.

For many years WWF has worked actively to implement the International Whaling Agreement. I once served as the personal

representative of the President to the IWC, and WWF Senior Scientist Roger Payne serves actively on its Scientific Advisory Committee.

WWF participates in every meeting of the International Tropical Timber Organization -- in fact, our delegations have been larger than most member delegations. Indeed, the WWF family was instrumental in establishing ITTO, as I and others in the organization were instrumental in establishing the World Heritage Convention. In the latter connection, we have formed and I chair the U.S. Committee for the World Heritage.

WWF provides considerable economic and technical support to help implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora. This includes the operation of the TRAFFIC network which monitors international trade in wildlife and wildlife products. WWF also played a pivotal role in establishing a permanent secretariat for the Ramsar Convention on Wetlands of International Importance. WWF's financial contributions to that secretariat are counted as part of the United States' dues to the Convention.

Finally in this area, WWF provided significant support in developing legislation to protect the African elephant, and last summer WWF made a commitment to raise up to \$2 million per year for three years to match a like amount appropriated by the U.S. government for elephant conservation in Africa. Subsequently, the Congress has enacted the African Elephant Conservation Act and authorized up to \$5 million to be appropriated in each of the next five years.

I summarize this extensive experience with the nuts and bolts of international environmental policy me to emphasize this important conclusion: an astonishing amount of progress in dealing with critical environmental problems could be made in the near future simply by making fuller use of the international legal framework already in existence to protect the environment and conserve natural resources, and the U.S. Congress is key to making what we already have in place fulfill its potential. Congress can measurably improve the global environment, and best prepare for the next generation of conventions and treaties, by breathing new life into the international environmental instruments and institutions that already exist.

Thus, my first three agenda items for the 101st Congress are:

1. Double the U.S. contribution to the United Nations Environment Program (UNEP) from \$9.5 million to \$20 million for fiscal year 1990 and retain that level for 1992. UNEP clearly came into its own by skillfully steering the Montreal Protocol through scientific uncertainty and political mistrust to almost landmark diplomatic achievement. UNEP has gained the trust of a wide range of parties. If progress is made on new international initiatives to deal with global warming, I would expect UNEP to play a critical role.

2. Promote full funding and a permanent line item in the federal budget for U.S. obligations under all international treaties and agreements that provide the legal framework for protecting the environment and natural resources. For example, the United States is about \$150,000 in arrears on its dues to the International Tropical Timber Organization. The World Heritage Convention, the Ramsar Convention and the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere should all be well funded, each as a separate line item. Congress should also take pains to ensure high level policy officials be assigned to represent the United States at meetings of these conventions.

3. Authorize the President to maintain United States membership in the International Tropical Timber Organization, and provide \$5 million in fiscal year 1990 and \$10 million in fiscal year 1991 for research and development projects that foster conservation and sustainable use of tropical forests. The Congress has yet to give official consent to United States membership and participation in this unique organization, which was formed to implement recommendations stemming from the 1985 International Tropical Timber Agreement (ITTA). This next decade must be one of urgent experimentation in sustainable tropical forestry. The ITTA is the only international commodity agreement with a conservation mandate, and excellent projects are ready at ITTA but lack funding.

I emphasize this matter because I have been asked to comment on proposals to impose United States sanctions on companies or governments which do not practice sound policies to prevent the destruction of tropical forests. Innovative solutions are sorely needed to address the challenge of tropical deforestation and its many consequences, yet I am convinced that the approach of the "stick" of sanctions would be seriously counterproductive. I have yet to see economic sanctions achieve any useful result and in this case I would predict that they would be received as an

intolerable interference in the internal affairs of the nations involved. Unilateral actions of this kind should be avoided by the United States. The need is to develop a cooperative international framework within which to pursue our objectives.

I urge Congress to reject such proposals for sanctions and to fund projects that will give tropical countries sensible alternatives to prevailing, wastefully destructive modes of forest development.

The International Financial System and the Environment

The dominant issue facing the international financial system is, of course, the staggering foreign debt by so many nations, Latin American countries in particular but also nations in Africa, Asia, and Eastern Europe. The new U.S. strategy for dealing with the problem, outlined in the general contours of the "Brady Plan", entails debt alleviation through reduction of principle, reduced interest payments and new loans. I believe this focus on debt alleviation holds a great deal of promise, especially if it is comprehensive and significant enough to stem the present negative cash outflow from debtor nations.

I would caution, however, that care must be taken to ensure that economic restructuring of debtor nations' fragile economies, which will surely be a part of debt alleviation measures, protects the most vulnerable groups in these societies and provides new environmental guaranties. The environment is not going to be protected by a society that is destitute.

Developing innovative approaches to the present crisis is therefore paramount -- approaches which address debt reduction while promoting environmentally and economically sustainable development. I am gratified in this regard by President Bush's announcement this past Monday that debt swaps, including swaps for environmental purposes, will be part of the economic aid program he is proposing for debt-ridden Poland. He is the first President to endorse such a mechanism as an instrument of foreign aid and debt relief, and we welcome this signal that the Administration plans to explore innovative approaches to debt reduction.

I urge the Congress to explore further ways to promote innovative debt relief mechanisms such as debt swaps. In recent years crushing debt burdens have led many countries to accelerate exploitation and exportation of natural resources, particularly tropical timber, and to promote economic policies

which provide short term economic benefits but cause long-term damage to the environment. Sound, sustainable management of the natural resource base must be an integral part of whatever new financial or economic measures the United States promotes in addressing the debt crisis. The Congress should therefore seek to ensure that environmental interests are "at the table" in any debt restructuring discussions.

I would point out that several other of the world's major industrialized nations are already actively exploring ways of linking debt relief to the environment at the highest policy levels. On April 12, Spanish Prime Minister Felipe Gonzalez gave a speech before the European Parliament in his capacity as Head of Government of Spain (which currently holds the Presidency of the European Community) in which he stated that he plans to put "debt-for-nature" swaps, and the specific role the EC can play in them, on the agenda of the next meeting of Heads of State and Governments in June. Several other European states, including France, Germany, and Sweden, have similarly endorsed the development of debt relief policies which call for enhanced environmental protection. Strong United States support and participation in crafting these policies could significantly advance their progress.

Such policies, of course, must be developed cooperatively with debtor nations through open and wideranging negotiations. I appreciate that "conditionality"--environmental or otherwise--is not looked upon with much favor by debtor countries. However, it seems to me that debt restructuring that takes into account a realistic commitment to the conservation and sustainable management of natural resources would be entirely appropriate. Clearly, the wise management of natural resources is highly relevant to the long-term economic viability of the countries concerned. Nor need there be any reason why such a commitment be viewed as representing an abrogation of sovereignty.

WWF and CF can attest to the enormous interest -- in Africa, Latin America, and Asia -- in exploring how repayment or restructuring of international debt may be harnessed to the goals of protecting wildlife, forests, and other natural resources. WWF has concluded four "debt-for-nature" agreements to date, in Ecuador (two), Costa Rica, and the Philippines, totalling more than \$12 million (face value of the debt). In addition, several other new agreements are in various stages of discussion.

Of course, these debt purchases relieve but a tiny fraction of the debt owed by these countries, but they represent a truly major increase in the amount of funds the recipient countries are able to devote to conservation. Most importantly, these initiatives originate within and have the support of the debtor nations and have been favorably received within the U.S. financial community.

Thus, my fourth agenda item for the 101st Congress is as follows:

4. Urge the Administration to fully explore any and all opportunities to consider conservation of tropical forests and other natural resources as part of the Administration's plan for the international debt problem. A strong, bipartisan expression of support would be very useful. It would be especially useful for the Congress to urge the Administration to consider ways to encourage U.S. financial institutions to participate in debt for nature transactions.

Development Assistance--Bilateral and Multilateral

Reauthorization of the Foreign Assistance Act presents a vital opportunity for the international environment. Owing in large measure to the vigilance and oversight of this Committee, the Agency for International Development (US-AID) has made great progress on environmental aspects of its development assistance program in recent years. Both World Wildlife Fund and The Conservation Foundation work closely with US-AID, particularly in the field where we have a number of conservation projects funded in whole or in part by US-AID. This experience has provided us with a unique perspective on measures which could be taken to improve the way in which the United States carries out its development assistance responsibilities.

WWF and CF's program recognizes the close linkages between the conservation and wise management of natural resources and economic development, and we recognize also the tangible economic benefits of a sustainably managed natural resource base. Our projects seek to tie conservation projects and human well-being together wherever possible. More progress is needed on this front, and it can be furthered in the Foreign Assistance Act reauthorization.

I am therefore encouraged by the findings of the recent Report of the Task Force on Foreign Assistance to the House Foreign Affairs Committee, the "Hamilton Report", which promotes environmental sustainability as one of four primary objectives

for United States development assistance. I urge Congress, however, to recognize that such a definition of objectives is only a first step in what should become a sustained effort to review and improve the procedures through which the United States dispenses development aid.

I offer two recommendations for dealing with this complex subject:

5. Congress should support measures to significantly relax rules and regulations governing small grants to local non-governmental organizations (NGOs) and Private Voluntary Organizations (PVOs). United States development assistance should encourage local input and participation in project planning and implementation. It is often local NGOs, for example, which can most effectively incorporate biological diversity into traditional development projects by working in the field with the human communities whose development activities most directly impact on the natural resource base. The ability of local governmental organizations, NGOs, and research centers to independently plan and manage conservation programs will be a critical determinant of their ultimate success.

In this effort, United States development assistance needs to philosophically recognize that projects promoting conservation and development in many cases must be carried out by organizations which do not currently have the administrative capacity or staff to meeting strict reporting and procurement requirements. The success of such indigenous organizations depends on their flexibility and their capacity to respond quickly to on-the-grounds needs and changes, to establish trust at the grassroots level, to identify low-cost appropriate technologies, and to maintain continuity by staying with projects over a period of time. To meet these requirements, local groups must avoid operating under bureaucratic structures that limit flexibility.

This on-the-ground perspective contrasts with the present requirements of United States foreign assistance, which emphasizes strict and cumbersome procurement and reporting requirements. Each of these requirements, by themselves, are eminently sensible; however, their cumulative impact, we have found, can be so hampering even to large US-based organizations that projects goals become difficult to meet because staff time and resources are diverted to reporting on rather than implementing projects.

One very effective way to promote attention to environmental quality in the development assistance program would be to require the active involvement of non-governmental organizations in recipient nations in project development and implementation wherever practical, without unrealistic reporting and procurement requirements.

6. Congress should direct US-AID to promote improved and consistent environmental guidelines for all major development assistance donors. Last year The Conservation Foundation carried out, at US-AID's request, an exhaustive review of US-AID policies and programs for handling pesticides and other chemicals in its projects. The review found that, while stronger implementation was needed, US-AID's chemical policies were basically sound. But many other countries that provide development assistance have poor policies -- or no policies at all -- for safe use of chemicals in projects they fund. This raises the issue of "forum shopping", where recipient countries look to donors with the fewest restrictions on their grants or technical assistance.

It is especially important that a permanent and constant dialogue begin with Japan on such issues, for her bilateral foreign assistance is now on the scale of ours and has the same potential for good -- or for harm. Recently the international WWF family of organizations released a report on the Japanese tropical timber trade which found that Japanese development aid plays a central role in encouraging unsustainable tropical timber exploitation in Southeast Asia, particularly in the Malaysian provinces of Sabah and Sarawak. Mitigating damage caused by other nations' development aid policies should be a central topic for cooperative discussions between aid donor nations, and I urge the United States, through US-AID, to engage the Japanese government in a dialogue to address conservation and development issues. I would be pleased to submit a copy of WWF's report for the record.

As in the case of bilateral assistance, this Committee's attention to the environmental performance of the World Bank and other multilateral development agencies has had much to do with the encouraging progress we have seen among these institutions in recent years. A great many issues call for continued review and oversight of the performance of multilateral development banks (MDBs). But here are two specific initiatives Congress could support in the next 18 months that would have profound and lasting effects on the international environment.

7. Congress should urge the World Bank to continue to develop its strategy for protecting biological diversity. This past year, a World Bank task force on biological diversity, headed by Dr. Russell Mittermeier, WWF Vice President for Science, began to develop a strategy to protect wild plants and animals, with special emphasis on areas that are particularly rich in species. Over the next year the Bank could assist the long-term protection of millions of species and vital ecosystems through development and implementation of biological diversity action plans, such as the one the Bank has developed for Madagascar. Targeting the "hotspots" of biological diversity holds enormous potential for conserving the earth's flora and fauna. The figures are stunning:— just 3.5 percent of the globe's remaining tropical forest may contain 25 percent or more of its species, according to Dr. Mittermeier. In 18 months, country plans could be developed to guide Bank lending in at least a half dozen "megadiversity" countries.

8. Congress should press the World Bank to emphasize energy conservation in its \$2.5 billion power sector lending. Recently, The Osborn Center for Economic Development, a joint program of World Wildlife Fund and The Conservation Foundation, released a new study, Power to Spare: The World Bank and Electricity Conservation, by Julie VanDomelen. The study found that, due to inadequate financial capital and mounting environmental opposition to large scale conventional power plants, developing countries are rapidly falling behind in their efforts to increase electricity. The study projects a 45 percent shortfall in electricity supply versus needs in developing countries by 1995. By investing about \$60 billion in electricity efficiency improvements through 1995, developing countries could make up that entire shortfall—at a savings of more than \$200 billion in capital investment.

Furthermore, electricity conservation can reduce the strains on the environment that result from electricity generation-- destruction of tropical forest and wildlife habitats from hydroelectric facilities in tropical areas, releases of greenhouse gases and emissions from conventional fossil fuel generating stations, or accumulation of radioactive wastes from nuclear plants.

Domestic Environmental Progress

The emergence of international environmental issues on the world political scene has rather dramatically changed the scale on which we must follow Rene Dubo's famous adage--"Think globally, act locally."

Here are two "local" matters to which Congress must attend over the next 18 months if the United States is to retain its credibility as a leader in international environmental matters.

9. Reauthorize a Clean Air Act that makes U.S. efforts to control air pollution the envy of the world. The entire world, and especially the struggling nations of the Third World, are watching to see if the wealthiest and most privileged country on the planet can itself resolve an environmental issue of significant international and domestic moment.

10. Initiate a concerted bipartisan process that aims to develop an environmentally sound, long-term national energy policy by December, 1992. It is no longer possible to think of national or international environmental policy without thinking in the same instant of national and international energy policies. The two are linked at every turn--from the debate over drilling in the Arctic National Wildlife Refuge to the overwhelming challenge of global warming. If the global warming problem is to be addressed, for example, it will require reductions in carbon dioxide emissions through energy conservation, greater energy efficiency, the promotion of alternative energy sources, and vast reforestation schemes--among other efforts--and all these on a global scale.

Already the energy policies of one nation are tested and played against the environmental policies of another, most sharply from North to South. Brazil might well ask why it should preserve the Amazon as the deep-breathing "lungs of the world" when the United States happily persists in chain smoking.

I mention this because in so many respects progress on international environmental issues depends on U.S. leadership, and we cannot be a leader if we are seen as able to afford far more conservation than we are willing to practice.

I urge Congress to demonstrate the United States' commitment to improve energy efficiency and reduce carbon emissions by helping to replenish biologically and climactically critical tropical forests. The linkage between these issues is plain, and I suggest that it be made explicit in any negotiations on tropical forest protection. Indeed, international discussions which begin to link tropical forest protection with improved energy policies, debt restructuring, development assistance, and population policies would be highly constructive as long as the

extent of these linkages is not used as an excuse for inaction in any one sector.

As a first step, the 101st Congress and the Administration should begin to develop an environmentally sound national energy policy, one which can also serve as a model for other nations. A report by the Environmental Protection Agency on options for dealing with global warming (which was recently reported in the press) should provide an excellent foundation for developing a new U.S. energy policy. The report addresses a number of extremely sensitive subjects in a very forthright manner, and I commend EPA for identifying these issues and the options involved. Dealing with global environmental issues is not going to be easy. It will require a frank recognition of a lot of problems which are easier to sweep under the table. For example, to deal in any effective way with global warming will involve some very painful choices here at home including more fuel efficient autos, a substantial increase in the gasoline tax, more efficient home heating, greater attention to the difficult and highly sensitive issue of tropical forest protection, and the promotion of alternative energy sources, among other options. And if the world's natural resources are to be managed on a sustainable basis the world must mount a concerted attack on poverty and on human population growth. The sooner we recognize and face up to these realities the sooner and the better we can get on with the job of building a planet on which the human future can be assured.

Finally, I feel it is appropriate to address the current national and international concern raised by the recent oil spill in Alaska, and to recommend two cooperative ways for the United States to demonstrate international leadership in halting further pollution of the marine environment.

I can only agree with those who characterize oil spills as a global problem which demands global solutions (oil spills cannot be contained by national boundaries). Much treaty law on this subject is already in effect, notably the Marine Pollution Convention known as "MARPOL". MARPOL establishes construction, equipment and operational standards for ships, including oil tankers, and requires regular inspections to assure compliance. In addition, the treaty prescribes sanctions for ships failing to comply. The United States is party to MARPOL and a number of companion treaties which prescribe safety and pollution control measures, so in respect to regulating ships themselves, we are in reasonably good shape.

Yet United States treaty law applicable to ships falls short in two important respects. Fortunately, This Committee has before it treaties which will fill both gaps.

The first gap concerns compensation for damage resulting from oil pollution. You have before you two treaties that would establish an international compensation regime designed to work quickly and effectively to pay cleanup costs, provide funds to restore the marine environment, and compensate innocent parties who suffer damage from oil spills. These are the 1984 Protocols that amend the 1969 Civil Liability Convention and the 1971 International Fund Convention. This Committee held hearings on these treaties in 1986 and, I believe, decided to withhold further action on them until comprehensive oil spill legislation could be developed in tandem. I believe the time has come to consider these treaties anew, and to report them to the Senate without reservation, recommending advice and consent. Not only would ratification of these treaties fill a serious gap in the fabric of United States treaty law pertaining to the marine environment, it would also strengthen the hand of U.S. negotiators when dealing internationally with perplexing environmental and maritime issues.

The second gap in our treaty law concerns seafarers, the people who crew the ships that enter our ports and ply the waters off our coasts. A treaty was negotiated in 1978 titled International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers. This is the first multilateral treaty in history that comprehensively addresses standards and qualifications for ship's crews. Its provisions have already been incorporated into U.S. laws and regulations, but we need to be party to the treaty to enable our Coast Guard to effectively enforce the rules for foreign ships entering our ports. The treaty was sent to the Senate some years ago with a request for advice and consent, but stalled because of some problems in implementing its provisions for certain sectors of the marine industry. I understand that those problems have been solved, with solutions incorporated into regulations. What now remains is application of the treaty to foreign ships in U.S. jurisdiction. This the Senate can make possible by giving its advice and consent.

I use these marine treaties as examples to make the point that if we are to encourage other nations to adopt policies and practices which will protect the environment, we must demonstrate our own willingness to make and keep environmental commitments.

Thank you for inviting me to testify, Mr. Chairman. I will be happy to try to answer any questions the Committee may have for me now or later.

The CHAIRMAN. Thank you very much.

Now we would be delighted to hear from Mr. Speth.

Senator PRESSLER. Mr. Chairman, could I make a brief opening statement?

The CHAIRMAN. Yes, please.

OPENING STATEMENT OF SENATOR PRESSLER

Senator PRESSLER. Mr. Chairman, thank you very much for holding this important hearing on the international environmental agenda for the 101st Congress. I think it is extremely important. We in the agricultural sector of America are very concerned about environmental issues.

In fact, I have proposed an International Agricultural Conservation Reserve Treaty. Such a treaty would call for all major agricultural nations to set aside an equal percentage of land for conservation purposes. This would also help reduce worldwide excess grain stocks.

My fellow South Dakotans are very concerned about the drought we experienced last summer. The question has been raised as to whether indeed the drought was caused by global warming. According to some experts, South Dakota lies in an area of the United States that could undergo desertification if global warming continues unabated. It is easy to understand our concern.

Several proposals to mitigate global warming have included a provision calling for a 20-percent reduction in carbon dioxide emissions. That we will have to try to achieve. But also we have to look at the type of crops we are planting, the type of effect that these crops have on the global warming issues.

According to some predictions, global warming will benefit some areas of the world and damage others. Whether this factor will play a role in efforts to mitigate global warming remains to be seen.

We also have in South Dakota the Eros Data Center which receives and processes satellite pictures of the Earth's surface. The archives will be very important in the studying of the warming of the Earth.

The issue of global warming has been especially prominent here in the Senate. I know that our chairman has worked on it frequently in the Foreign Relations Committee. It has also been the topic of hearings in the Commerce Committee on which I serve and also the Environment and Public Works Committee. It is very appropriate that the Foreign Relations Committee should be heavily involved in the issue of global warming since international cooperation is necessary to effectively address this problem. It is my hope that an international agricultural conservation reserve treaty will be included in such efforts.

Mr. Chairman, I ask unanimous consent to place my statement and questions in the record.

The CHAIRMAN. Thank you very much. And the record will be kept open for your questions and for any other questions that are offered by other members of the committee.

[The prepared statement and questions of Senator Pressler follow:]

PREPARED STATEMENT OF SENATOR PRESSLER

The need for the formulation of an international environmental agenda has never been more clear than now. Global warming, tropical deforestation, ozone depletion, and other environmental dilemmas confront not only the United States, but the entire globe. Last summer's heat wave focused a great deal of the Nation's attention on our physical surroundings and the impact of human activity on the health of our surroundings. Other events, such as the discovery of the "hole" in the ozone layer in Antarctica, and the discovery of similar ozone damage in the Arctic region, and the recent oilspill tragedy in Prince William Sound, have thrust environmental issues to the forefront of congressional study and action. The issue of global warming has become especially prominent in the Senate, where it has been the topic of Commerce Committee hearings and Environment and Public Works Committee hearings, in addition to today's Foreign Relations Committee hearing.

However, efforts to solve these problems cannot remain solely within the perimeter of Washington. U.S. policy, no matter how effectively devised, implemented, and enforced, will be of little use if other world governments do not accept their share of the responsibility for environmental preservation. The complicated nature of restoring and preserving natural resources on an international scale does not make this task easy, but the process must go forward. I am gratified to see the Foreign Relations Committee hold a hearing on this issue, and I would like to take this opportunity to thank the members of the panel for their testimony today.

QUESTIONS ASKED BY SENATOR PRESSLER

Question 1. I have proposed that the President initiate the negotiation of an international agricultural conservation reserve treaty. Basically, the treaty calls for all major agricultural producing nations to agree not to bring any more virgin land into production and to take an equal percentage of existing cropland out of production for a minimum of 10 years. This would accomplish two goals: First, reduction of excess grain supplies, and second, control of resource depletion, such as soil erosion and deforestation. What is your general opinion of this proposal, and the possible usefulness of such a treaty for natural resource protection?

Question 2. Because of last summer's severe drought, many South Dakotans have become deeply interested in the problem of global warming. Since South Dakota lies in the area of the United States that could undergo desertification if global warming continues unabated, it is easy to understand their concern. Several proposals to mitigate global warming have included a provision calling for a 20-percent reduction in carbon dioxide emissions by the year 2000. How realistic is this goal? What sort of actions could be undertaken to achieve a 20-percent reduction?

Question 3. According to some predictions, global warming will benefit some areas of the world and damage others. For instance, in Canada the currently short growing season may be extended, and the Sahara and other desert areas may receive more rainfall. On the other hand, the midsection of the United States may be permanently transformed by devastating drought. Do you expect this aspect of global warming to complicate the establishment of any international accord on ways to combat the global warming phenomenon?

Question 4. What procedures does the World Bank follow to see that environmental concerns are adequately addressed as part of any World Bank-funded activity? Can you suggest any improvements in these procedures?

Question 5. Recently there has been a great deal of discussion about the possibilities of debt-for-nature swaps, particularly in Brazil. What is your assessment of the possibilities for such programs in Brazil or elsewhere in Latin America? Do you foresee any flexibility on the part of Brazil on this issue?

The CHAIRMAN. Mr. Speth.

Senator PRESSLER. And I also see one of my classmates from Oxford University who is a fellow Rhodes Scholar of mine I believe, if I remember correctly, from a few years back, and I am glad to see you here.

STATEMENT OF JAMES GUSTAVE SPETH, PRESIDENT, WORLD RESOURCES INSTITUTE, WASHINGTON, DC

Mr. SPETH. Thank you, Senator. I hope you don't have to leave too soon, but I will understand if you do.

Mr. Chairman, it is a great pleasure to be here. I'm a great admirer of you and your work on global environmental issues over the years and the work of this committee and its staff. It is also a privilege to be able to appear with Russell Train.

I want to first associate myself with the recommendations that he has made. There is not one of them that I would disagree with. They are very important.

We did have a chance to coordinate our statements a little bit, and what I would like to do is summarize some of my points that are in addition to the ones that Russell Train has made.

To begin with, I would like to submit for the record a copy of a report that we prepared specifically for the new administration and the new Congress that summarizes what are now 6 years of ideas and recommendations that our organization—the World Resources Institute—has developed for dealing with global environment resources and related issues. It is appropriately entitled "The Crucial Decade: The 1990's and The Global Environmental Challenge."

[The information referred to follows:]

THE CRUCIAL DECADE: The 1990's and the Global Environmental Challenge

World Resources Institute

FOREWORD

Twenty years ago, the United States responded vigorously to the serious environmental concerns then emerging. New national policies were declared, new agencies created, and major pollution clean-up and resource management initiatives launched.

Today, as we enter the 1990s, the Bush Administration and the 101st Congress face a new agenda of environmental concerns that are more serious and challenging than the problems of the 1970s.

The buildup of carbon dioxide and other gases in the atmosphere threatens far-reaching climate changes, while one class of these gases—the chlorofluorocarbons—are depleting the earth's ozone layer, which shields us from the sun's ultraviolet radiation. Here at home, air pollutants are escaping our urban-industrial areas and invading the countryside, seriously damaging aquatic life, forests, and

ops
In the developing world, pressures on natural resources intensify daily. The deserts expand while the forests, with their immense wealth of life forms, retreat. Hundreds of millions of people live in absolute poverty, destroying the resources on which their future depends because no alternative is open to them.

These concerns are not the ones to which the United States addressed itself when environmental concerns emerged forcefully twenty years ago. They present us with new policy challenges that are more global in scope and international in implication.

The 1990s will be the crucial decade for action on these pressing concerns. If major national and international efforts are not pursued in this period, irreparable damage will be done to the world's environment, and the problems will prove increasingly intractable, expensive, and dominated by crises.

Our hope must be that the Bush Administration and the new Congress will rise to this occasion, just as American leaders rose to meet the environmental challenges of twenty years ago.

To assist in this effort, the World Resources Institute has brought together in this publication brief descriptions of critical world environmental problems and a checklist of measures to deal with

them. Rather than fully describe all measures needed to address America's environmental challenges, this report focuses on priority initiatives needed to deal with the two principal threats to the global environment—large-scale atmospheric deterioration and biological impoverishment. Additional discussions and analysis of most of the initiatives suggested here can be found in the readings noted at the end of this report.

In developing these recommendations, the WRI staff has followed these precepts:

- rely on the market mechanism whenever possible, in part by ensuring environmentally accurate prices;
- speed the application of existing and new solution-oriented technologies that promote environmentally sustainable development;
- attack pollution at the source by shifting from "pollution control" to waste and pollution minimization; and
- focus U.S. efforts in developing countries where they are most needed: on generating environmentally sustainable livelihoods for the poor, on enhancing the long-term productivity of the resource sectors, and on slowing population growth.

WRI offers these recommendations in the spirit of hope and optimism. Tropical deforestation can be arrested and disappearing species saved; poverty can be alleviated and human populations stabilized; soils can be conserved and more food provided; climate change can be contained; regional and global pollution can be reduced.

These and other things can be done with means within our grasp. But success hinges on a concerted effort made with some urgency to change many current policies, to strengthen and multiply successful programs, and to launch bold initiatives where they are needed.

There are ample grounds in the experience of the last two decades for both optimistic and pessimistic assumptions about the future. The gaps between success and failure in addressing resource, environmental and population problems have been enormous. The good news is that these divergent outcomes are primarily the result of differences in policies and programs pursued by governments, the private sector, and others. In short, leadership and new initiatives can make a world of difference.

James Gustave Speth
President
World Resources Institute

I. THE GLOBAL ENVIRONMENTAL CHALLENGE

Writing recently in *Foreign Affairs*, George F. Kennan observed that "our world is at present faced with two unprecedented and supreme dangers": any major war at all among great industrial powers and "the devastating effect of modern industrialization and overpopulation on the world's natural environment."

The deterioration of the global environment to which Kennan refers has a scale that encompasses the great life-supporting systems of the planet's biosphere. It includes the alteration of the earth's climate and biogeochemical cycles, the accumulation of wastes, the exhaustion of soils, loss of forests, and the decline of ecological communities.

Since World War II, growth in human population and economic activity has been unprecedented. The world's population has doubled and now exceeds five billion, and another billion will be added by the year 2000. The gross world product has increased fourfold since 1950. With these increases in population and economic activity have come large increases in both pollution and pressure on natural resources.

Air pollution today poses problems for all countries. As use of fossil fuels has increased, so have emissions of sulfur and nitrogen oxides and other harmful gases. Acid rain, ozone, and other ills born of this pollution are now damaging public health and harming forests, fish, and crops over large areas of the globe.

Another gas emitted when fossil fuels burn is carbon dioxide, the chief culprit among the greenhouse gases, which trap heat in the atmosphere. If the buildup of greenhouse gases in the atmosphere is not halted, the global warming now apparently under way will bring major climate changes. Regional impacts are difficult to predict exactly, but rainfall and monsoon patterns could shift, disrupting agriculture in many areas. Sea levels could rise, flooding coastal areas. Ocean currents could shift, further altering the climate and fisheries. Fewer plant and animal species could survive as favorable habitats are reduced. Heatwaves, droughts, and other weather anomalies could harm susceptible people, crops, and forests.

Depletion of the stratosphere's ozone layer also threatens human health and natural systems. The 1987 international treaty negotiated to address this

problem by reducing the use of chlorofluorocarbons (CFCs) is already considered inadequate since scientists recently discovered more ozone depletion than expected.

These interrelated atmospheric issues constitute the most serious pollution threat in history. Simultaneous and gradual, their effects will be hard to reverse. Because pollutants react with other substances, with each other, and with the sun's energy, a well-planned response has to take all these factors into account. These air pollution issues are also linked to the use of fossil fuels. In the future, energy policy and environmental policy should be made together.

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These interrelated atmospheric
issues constitute the most
serious pollution threat in
history.
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The United States can take some pride in actions to improve air quality. But our country still emits about 15 percent of the world's sulfur dioxide, about 25 percent of all nitrogen oxides, and 25 percent of the carbon dioxide, and it still manufactures about 30 percent of all CFCs.

Improvements in U.S. energy efficiency have been considerable. Per capita energy use dropped by 12 percent between 1973 and 1985—a period when per capita gross domestic product grew 17 percent. Yet, the United States is still consuming one fourth of the world's energy annually and producing only half as much GNP per unit of energy as its world market competitors such as West Germany or Japan.

Our national concern for the atmosphere must be matched by a growing awareness of the steady deterioration of forests, soils, and water in much of the developing world. The U.N. Food and Agriculture Organization predicts that, without corrective action, rainfed croplands in the Third World will become 30 percent less productive by the end of the century because the soil is depleted or eroded. In developing countries, ten trees are cut down for every

one replanted—30 trees for one in Africa—and every minute about 54 acres of tropical forests disappear, as do uncounted species that inhabit them. Fuelwood shortages affect an estimated 1.5 billion people in 63 countries. Most people lack access to basic sanitary facilities, and 80 percent of all illness is due to unsafe water supplies. Third World people now rank high among those exposed to toxic chemicals—from lead in Mexico to DDT in China.

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Last year, the World Commission on Environment and Development articulated a new consensus, supported by nations North and South. The old notion that environmental loss was the price of economic progress was rejected. Far from bringing about broad-based development, overexploitation or mismanagement of natural resources has contributed to famines and floods, dams that silt up within a decade, irrigation schemes that salt the soil, and the conversion of grasslands and tropical forests into unproductive wastelands. The report of the Commission, *Our Common Future*, stated:

Many forms of development erode the natural resources upon which they must be based, and environmental degradation can undermine economic development. Poverty is a major cause and effect of global environmental problems.

Fighting poverty requires diffusing the underlying pressures on the world's resource base. While many complex factors are involved, the Third World must deal with:

- Rapid population growth. Of the one billion people to be added to the world's population

by the year 2000, 9 out of 10 will be born in the developing countries.

- Shortsighted economic policies pursued by governments of both industrial and developing countries. These include direct and indirect subsidies that encourage the wasteful use of energy, water, and forests, and policies that favor city dwellers over the rural poor.
- Misguided development and aid programs. Many large-scale development projects have neglected environmental factors and local needs.

The United States is directly affected by these Third World concerns. Twenty percent of the carbon dioxide contributing to the greenhouse effect is estimated to come from tropical deforestation. A wide range of biological resources—species yet to be analyzed for their agricultural, industrial, or pharmaceutical value—is being lost.

The growth of developing economies expands U.S. trade and job opportunities at home; already more than a third of U.S. trade is with the Third World. With economic recovery, the developing countries could absorb up to half of all U.S. exports by the year 2000. But sustained growth in much of the developing world requires better management of natural resources.

"Sustainable development" is the widely accepted answer—development that meets today's needs without compromising the ability of future generations to meet theirs. U.S. leadership in applying this approach requires both vigorous evaluation of environmental consequences of development assistance programs and also support for national development strategies that conserve and restore the land's productive capacity. It means helping developing countries invest in reforestation, agroforestry, water conservation, and energy efficiency. It also means reducing debt and other pressures that force Third World countries to cash in their natural resources to earn foreign exchange. Family planning, primary health services, and better sanitation all deserve a high priority since they reduce child mortality and slow birth rates.

In the 1990s, industrialized and developing countries will have to face these challenges together. Nations North and South, East and West must act in concert to sustain the earth and its people. In this effort, U.S. leadership could not be more important.

II. AN AGENDA FOR THE PRESIDENT AND THE CONGRESS

To respond to these global environmental challenges, ten areas stand in need of vigorous leadership by the President and the Congress. They are closely linked one to another; initiatives in these areas should be seen as elements of an integrated package.

THE GREENHOUSE EFFECT

1. The President and the Congress should declare protection of the global atmosphere a priority national objective. The United States should call for a high-level international meeting, perhaps convened jointly with the Soviet Union, to develop the initiatives needed to address the greenhouse effect, global climate change, and the destruction of the stratospheric ozone layer. Topics high on the list for discussions at this summit meeting should be: (1) how to achieve a complete phase-out of the chlorofluorocarbons (CFCs) that are contributing to the greenhouse effect and damaging the earth's protective ozone shield, (2) how to promote international agreement on preventing further global warming by reducing world emissions of carbon dioxide and other greenhouse gases, and (3) how to develop concerted international action to move from net deforestation globally to net afforestation. In preparation for this international meeting, federal officials should carry out an intensive review of the "carbon dioxide emissions charge" proposal, which would reduce carbon dioxide emissions by promoting more efficient use of fossil fuels and providing incentives to energy sources that produce less or no carbon dioxide, the principal greenhouse gas.

OZONE LAYER DEPLETION

2. The President and the Congress should give strong support to strengthening the treaty protecting the earth's stratospheric ozone layer. The U.S. goal should be the complete phase-out of offending chlorofluorocarbons by 2000. At the national level, the United

States should set an international example by minimizing chlorofluorocarbon releases during the phase-out period.

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The President and the Congress should declare protection of the global atmosphere a priority national objective.
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ENERGY POLICY

3. The President and the Congress should call for the development of a new energy strategy for the United States, one that gives balanced attention to adequate and affordable energy supply, national security, and environmental protection, including the need to reduce emissions of carbon dioxide and other greenhouse gases. The cornerstone of this new policy should be large, steady gains in U.S. energy efficiency, with the goal of matching the performance of Europe and Japan. Both energy price reform and regulatory requirements will be needed. One important element of the new U.S. energy policy should be a gradually rising tax on gasoline.

ACID RAIN

4. The President and the Congress should work together to develop a new approach to "acid rain" control. Unlike some previous proposals, however, this new approach should address in a coordinated fashion all the principal pollutants that are causing damage to aquatic systems, forests and agricultural crops, and it should allow cost-effective, flexible means to achieve pollution reduction, including energy efficiency improvements, fuel switching, transportation and land use policies, and new combustion and pollution control technologies.

TROPICAL FORESTS AND BIODIVERSITY

5. In cooperation with other nations, the Bush Administration and the Congress should promote national and international initiatives aimed at halting the destruction of the world's remaining tropical forests and the extinction of countless plant and animal species. U.S. development assistance, trade, tax, Third World debt, and other policies should all be reviewed with an eye to how they can contribute to this goal. Special consideration should be given to recent proposals that tropical forest conservation be undertaken in exchange for major debt relief, and to the proposal of the World Commission on Environment and Development that new international facilities be created to sharply increase financing for conservation projects in developing countries.

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The Bush Administration and the Congress should launch a multi-pronged effort to make U.S. talent, expertise, technology, and resources available to help reverse the resource deterioration that is undermining development prospects in Africa and elsewhere.

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ENVIRONMENT AND DEVELOPMENT ASSISTANCE

6. Recognizing that environmental deterioration is one of the gravest problems facing developing countries today, the Bush Administration and the Congress should launch a multi-pronged effort to make U.S. talent, expertise, technology, and resources available to help reverse the resource deterioration that is undermining development prospects in Africa and elsewhere. One important, early initiative should be to support a new Foreign Assistance Act that makes the closely linked problems of poverty, environmental decay, and rapid population growth the primary focal points for U.S. assistance and cooperation with the Third World.

POPULATION AND HEALTH

7. Rapid population growth poses one of the gravest threats to the world environment, particularly in many developing countries where the press of mass poverty on fragile resources is having alarming consequences. The Bush Administration and the Congress should encourage national and international efforts to promote the transition to a stable world population of about nine billion by the middle of the next century. New initiatives are needed by the United States and others to expand greatly the educational and employment opportunities for women in developing countries, to reduce death rates by making basic sanitary services and health care widely available, and to make family planning services available to all.

DESIGNING NEW SOLUTIONS

8. To look ahead, the President and the Congress should establish a distinguished panel from within and outside government to recommend long-term goals for meeting the following challenge: how can the major sectors of the U.S. economy—manufacturing, agriculture, transportation, housing, and energy—be redesigned in the years ahead so that they fulfill economic needs without destroying our national and global environments? To find efficient and effective solutions, and to avoid endless confrontation, environmental goals must move “upstream” and be integrated into the design of our industrial and agricultural systems. The panel would examine what America's longer term goals should be in these areas, and it would explore how “seeing the future” can be used to enhance American exports.

GLOBAL ENVIRONMENTAL POLICY ACT

9. The National Environmental Policy Act of 1969 provided a charter for the protection of our national environment. Twenty years later, the President and the Congress should work together on legislation that would provide a charter for U.S. policy and action to protect the global environment. This legislation would contain findings regarding the nature and seriousness of the principal international environmental threats; it would declare national policies on protection of the

global environment; and it would make those policies and appropriate specific measures part of the mandates of federal agencies, including those agencies responsible for economic policy, trade, international economic assistance, and scientific research. The legislation would also provide the framework for coordination within the federal government for a sustained attack on global environmental problems.

ADMINISTRATION LEADERSHIP

10. In order to ensure that the President's desire to give priority attention to the global environment is effectively implemented, the President should appoint a White House counselor of Cabinet rank to develop and coordinate this overall effort. This person should have a clear mandate from the President to work with the Executive agencies and the Congress to develop concrete proposals in the areas discussed here and, once the program is developed and approved by the President, should have responsibility to monitor its implementation. Alternatively, the President, having elevated the head of

the Environmental Protection Agency to Cabinet rank, could assign this person these new responsibilities.

These initiatives and others are described more fully in the sections that follow. While policy initiatives of the types discussed here are essential if progress is to be made, they should be coordinated with increased scientific research and environmental monitoring and with greater efforts to inform the public and educators. The greenhouse effect, biodiversity, and other topics require major new research efforts in both the natural and the social sciences.

Also, this report focuses on U.S. initiatives and does not explicitly address intergovernmental institutions. But the role of the UN Environment Programme in helping governments and others come to agreement on how to cope with stratospheric ozone depletion reminds us of the critical role international bodies can play. For many of the issues discussed here, it is already clear that broad international cooperation is essential. United Nations and other international bodies afford opportunities for the United States to present new initiatives that will command international support.

III. SLOWING THE GREENHOUSE WARMING

Droughts and heat waves in 1988 gave Americans a taste of what a global warming trend could mean. Such climate changes are likely because the atmosphere's increasing concentrations of carbon dioxide and other trace gases trap the earth's infrared radiation, preventing it from escaping into space. These "greenhouse" gases are produced in the burning of coal, oil, and natural gas, by deforestation and certain agricultural activities, and through the release of various industrial chemicals.

The largest contributor to the greenhouse effect is carbon dioxide, which comes principally from fossil fuel combustion. Half of the carbon dioxide added to the atmosphere throughout human history has been added during the past 30 years. Other gases, including the same chlorofluorocarbons (CFCs) that destroy the stratospheric ozone shield, also play roles in the greenhouse effect. Some CFCs absorb infrared radiation up to 10,000 times more efficiently (per molecule) than carbon dioxide does.

In the lower atmosphere, one of the most common air pollutants, ozone, is also a greenhouse gas, as are methane and nitrous oxide. All three are linked to fossil fuel use, but methane and nitrous oxide are also released in agriculture and forestry.

Unless all these emissions are reduced, temperatures will rise in the decades to come, with potentially severe consequences. Even if all greenhouse gas emissions were stopped today, the planet would still warm by 2° to 4°F, according to current estimates. If emissions continue growing at today's rates, the average global temperature would rise by 3° to 8°F by the time today's teenagers reach retirement age.

The greenhouse effect will not register in the same way everywhere. Temperature rises will be greatest in the higher latitudes, and this uneven warming will influence the winds and ocean currents that determine climate. Some areas will have more rainfall, others less. If current predictions hold, important agricultural areas in the U.S. Midwest and Southeast would be hotter and drier during the growing season. An expansion in grasslands and deserts, a decline in forest ecosystems, along with forest fires and species losses, could accompany the warming. Some irrigation and hydroelectric projects would no longer receive adequate rainfall, while others might overflow.

Changes in the oceans can be expected too. Coastal development and wetlands would be threatened by a 1- to 4-foot rise in sea level by the middle of the next century. Storm damage to lagoons, estuaries, and coral reefs, not to mention buildings and other man-made structures, would also increase. By one recent estimate, erecting protective barriers and making other adaptations to sea-level rises would cost a medium-sized city such as Charleston, South Carolina about \$1.5 billion.

Most greenhouse gas buildup comes from fossil fuel combustion, but not all fuels contribute equally. Per unit of energy released, coal burning releases the most carbon dioxide; the same amount of energy from oil releases 30 percent less carbon dioxide; natural gas, half as much. Energy produced from nuclear or renewable resources (such as hydro power, wind, or solar technologies) releases no carbon dioxide. To the extent that people turn toward energy technologies that release less carbon dioxide, emissions would fall even if energy use did not.

Meanwhile, the cutting and burning of tropical forests contributes about 20 percent of the carbon dioxide added to the atmosphere each year. Although these forests do far more in the biosphere than store carbon, their role in regulating the greenhouse effect should not be overlooked.

The world's choice is not between preventing a temperature rise or adapting to climate changes. A certain amount of warming now appears inevitable. But action taken today can stabilize future warming and allow societies more time to adapt to unavoidable changes. The political drawback is that the costs of preventing damage must be paid now, even though the future benefits are uncertain. But if policy choices are put off, more extreme measures will be needed in the future. Almost certainly, waiting is not the best policy.

To address the greenhouse effect, several major steps need to be taken:

1. The President and Congress should make addressing the greenhouse issue a high national priority and commit the United States to action on both the national and international levels. The immediate goal should be to slow down the current rate of global warming; after this transition, the goal should be to

stabilize the concentrations of greenhouse gases and halt the greenhouse warming. Both require diligent national and international efforts to reduce greenhouse gas emissions dramatically.

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The world's choice is not between preventing a temperature rise or adapting to climate changes. A certain amount of warming now appears inevitable. But action taken today can stabilize future warming and allow societies more time to adapt to unavoidable changes.

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2. On the national level, our growing understanding of the greenhouse effect should become a major determinant of U.S. energy policy. The threats that global warming, air pollution, and increased dependence on foreign oil pose to the United States are all intimately linked to energy use, mainly fossil fuels. Triple-edged energy policies simultaneously addressing all these concerns should be adopted. These include: (a) improving the efficiency with which the United States uses energy; (b) switching to natural gas and other fuels that produce comparatively less carbon dioxide; and (c) developing such non-fossil sources of energy as solar power (and other “renewables”) and perhaps a new generation of nuclear power plants. (See Section VI for additional discussion of energy issues.)

3. On the international level, the United States should call for a high-level international meeting to begin discussing how to limit greenhouse gases and reduce global carbon dioxide emissions. Discussions should cover: (a) the timing of a total phase-out of chlorofluorocarbons (discussed in Section IV); (b) means for reducing global carbon dioxide emissions; and (c) means for slowing and then halting deforestation in tropical countries and promoting net growth of forests globally (discussed in Section VII). In addition, the United States, through its bilateral foreign assistance programs and leadership in multilateral efforts, should help developing countries slow population growth and use highly energy-efficient technologies and non-fossil energy sources. (See Section VIII for additional discussion of these issues.)

In preparation for this international meeting, federal officials should carry out an intensive review of the “carbon dioxide emissions charge” proposal, which would impose a fee on the suppliers of fossil fuel—coal, oil and natural gas—proportional to the carbon dioxide released when these fuels are burned. Such a charge could reduce carbon dioxide emissions by promoting more efficient use of fossil fuels and providing incentives to energy sources that produce less or no carbon dioxide, the principal greenhouse gas. Proceeds from the charge could be applied to a variety of purposes: investments that would enhance U.S. competitiveness in international markets, rebates to lower-income energy consumers, deficit reduction, and programs to promote forest conservation and reforestation globally. Alternatively, this emissions charge could be revenue neutral. Such a charge could be adopted by the United States or pursued multilaterally.

IV. PROTECTING THE EARTH'S OZONE SHIELD

Ozone can both harm and help man and the environment, depending upon where it resides in the atmosphere. Near the earth's surface, ozone and other oxidants, sometimes called smog, take a toll on human health, damage trees, and reduce crop yields. In the lower atmosphere, ozone also acts as a greenhouse gas. But in the stratosphere, it acts beneficially—filtering harmful ultraviolet radiation, forming a shield around the planet. Weakening this shield invites more skin cancers and eye disease, a reduced immune response, and harm to plant and animal life.

Fifteen years ago, scientists predicted that chlorofluorocarbons (CFCs), highly stable compounds released from aerosol cans, refrigeration systems, and blown-foam materials, would rise into the stratosphere and, through a complex chemical reaction, destroy some of the ozone, thus allowing increased amounts of ultraviolet radiation to reach the earth's surface. Theory became fact when scientists in Antarctica discovered a large "hole" in the ozone layer in October, 1985, and three years later confirmed that CFCs had caused it. In the northern hemisphere, a more widespread decrease in ozone levels of about 3 percent has been observed—a loss too large to attribute to nature.

CFCs also contribute to the greenhouse effect. Indeed, molecule for molecule, they can be 10,000 times as efficient as carbon dioxide in trapping heat in the atmosphere.

In response to ozone depletion, governments around the globe, led by the UN Environment Programme, agreed in November, 1987, to the Montreal Protocol, which would halve CFC use in the industrial countries by 1999. But given the latest evidence of damage, the Protocol is now widely viewed as insufficient to protect the ozone layer.

Two major strategies need to be pursued in order to prevent further erosion of the ozone shield:

1. The United States should support the renegotiation of the Montreal Protocol to ac-

complish a complete global phase-out of fully halogenated CFCs by the year 2000. The Protocol should also be expanded to address other ozone depleting compounds not now covered.

Given the latest evidence of damage, the Montreal Protocol is now widely viewed as insufficient to protect the ozone layer. The United States should support the renegotiation of the Protocol to accomplish a complete global phase-out of fully halogenated CFCs by the year 2000.

2. On the national level, the United States should assert the kind of leadership it assumed in halting the use of CFCs in aerosol cans by developing market and regulatory strategies that will encourage rapid replacement of CFCs with safe substitutes and reduce releases to the atmosphere. These twin goals can be met by (a) a \$5 per pound user fee on CFCs that would make safe substitutes competitive and encourage capture and reuse; (b) a deposit-return system (whereby returned CFCs in discarded appliances would be recovered and reused or destroyed); (c) regulations that would reduce leakage rates from devices such as auto air conditioners and require capture of CFCs in foam blowing and other industrial activities.

V. CURBING ACID RAIN AND OXIDANTS

Damage to public health, forest diebacks, lifeless lakes, and soured soils—these are signs that air pollutants are taking a toll. Gauging the effects of each pollutant has never been simple because air pollutants mix together, interact, and compound other environmental stresses. Yet, the planet is feeling pollution's impacts. Between 1900 and 1985, the world's annual sulfur dioxide emissions increased sixfold, while nitrogen oxide emissions increased ten times over. These gases, together with the hydrocarbons that also result from fossil fuel combustion, are the principal sources of both urban air pollution and the acid rain and oxidants that now douse the North American countryside.

The damaging effects of acid rain on aquatic life in U.S. and Canadian waters have been well documented over the last decade. But the evidence is now also convincing that air pollution is contributing to the death of forest trees and widespread losses in crop productivity in the United States. Extensive damage due to ozone and other oxidants has been documented among pines in California and in the eastern United States. And the case is strong that air pollution is an important contributor to the declines of other stricken tree species in the East, including the high-elevation red spruce in the Appalachian Mountains from Vermont to North Carolina, and Fraser fir in the Southeast.

Crop productivity is also being impaired, with ozone losses among sensitive crops ranging between 5 and 20 percent. Overall agricultural crop losses from air pollution have been estimated at up to \$5 billion annually.

Acid deposition and oxidant levels are high where tree and crop damages are occurring. Along the Appalachian Mountain chain the acidity of cloud moisture is 10 times greater than that at low elevations and about 100 times greater than that of unpolluted precipitation. The peak cloud acidity at several eastern mountains rivals that of lemon juice.

Unless strong new measures are adopted, the nation's air pollution problems are going to steadily worsen in the coming decades, leading to further forest damage, crop losses, ill health, water and soil acidification, damage to materials and losses in visibility.

The Bush Administration and the Congress should work together to accomplish the following:

1. Annual emissions of sulfur dioxide and nitrogen oxides—the pollutants primarily responsible for acid rain and ozone (oxidant) formation—should be reduced by 10 million and 5 million tons respectively. State-by-state emission caps should be adopted, and states should be given the flexibility to use a broad range of cost-effective tools to meet their goals: energy efficiency, fuel switching, new combustion technologies, transportation and land-use planning, and pollution control equipment.

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2. Pollution from transportation—the single largest source of several important air pollutants—can be cut significantly through a combination of stricter federal emission levels for cars, buses and trucks; strengthened inspection and maintenance procedures; and the use of cleaner fuels (such as compressed natural gas) in commercial fleets and urban buses. Programs that would cut the total number of vehicle-miles traveled and improve traffic flow would help reduce transportation emissions further. Promising measures include greater use of public transit, preferred parking for car pools, and provisions for high-occupancy vehicles.
3. A sensible pollution control strategy must also recognize two other long-term energy-related problems: our increasing reliance on foreign oil and climate change. To cope with these risks, the United States must increase

the efficiency of fossil fuel use, especially in transportation, which is almost totally dependent on oil, increasingly imported. We also need to accelerate the development of non-fossil energy technologies. In practical terms, this means electric and hydrogen-

powered vehicles as well as the renewable energy technologies—solar photovoltaic cells, wind turbines, hydro power, solar hot water heaters and geothermal energy. (Energy initiatives are discussed further in Section VI.)

VI. FORGING NEW ENERGY STRATEGIES

If energy use is the yardstick, the United States currently has one of the world's least efficient economies. Japan and West Germany both now produce about twice as much GNP per unit of energy as we do. The excessive use of energy has contributed to the decline of U.S. industrial competitiveness, to a continuing balance-of-trade deficit, and to growing threats from pollution and climate change. Improving energy efficiency is thus essential to overcoming the multiple threats of energy security, air pollution, and climate change. (Climate change and the greenhouse effect are discussed in Section III; air pollution in Section V.)

Today, the United States imports 38 percent of its oil, half from OPEC nations. According to the Department of Energy, imports could reach 50 percent of supply by the mid-1990s. Some oil-industry spokesmen have indicated that the United States could be forced to import 75 percent of its supply by the turn of the century. These imports—worth over \$40 billion in 1987—seriously aggravate the trade deficit and affect U.S. foreign policy.

Currently, the United States has no comprehensive energy policy that addresses the sources of energy supply, the patterns of energy consumption, national security, and environmental protection. Such a policy should be based primarily on increased national energy efficiency and accelerated development and wider use of non-fossil energy technologies.

Three major steps are needed to forge a new U.S. energy strategy:

1. The United States should make sharp, steady improvement in energy efficiency the centerpiece of national energy policy. Federal and state initiatives should seek to realize a national goal of doubling U.S. energy efficiency by meeting the three percent annual improvements achieved earlier in this decade. This would free up capital for new investments, reduce our balance of payments deficit, improve our energy security, and reduce air pollution and carbon dioxide emissions at substantial cost savings.

In transportation, the following national measures should be adopted to spur more efficient use of vehicles:

- Phasing in a one-dollar per gallon gasoline tax over a decade;
- Applying a graduated sales tax based on the rated fuel efficiency of vehicles;
- Raising auto fuel standards to 45 miles-per-gallon by the year 2000; and
- Using efficiency standards to guide all government purchases of vehicles.

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The United States should make sharp, steady improvement in energy efficiency the centerpiece of national energy policy.
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States should have two transportation objectives in this area. First, with federal assistance, they should develop more efficient public transportation systems. Second, through sound land use planning, they should reduce the amount of travel required.

Efficiency in electricity generation and use should be encouraged by such measures as:

- Strengthening building codes to reduce the energy needed for heating, cooling, and lighting;
- Requiring utilities to develop least-cost energy planning that includes financial and other incentives for demand-reducing efficiency improvements; and
- Using tax credits and other measures to encourage the use of more efficient electricity production technologies (such as gas turbines with cogeneration of electricity and heat).

2. Federal policy should stimulate the use of alternative, non-fossil sources of energy and fuel switching from coal and oil to natural gas:

- Renewable energy sources are significant contributors now and will be much more important to our energy mix in the longer term. Photovoltaics, solar thermal, wind, biomass, hydropower and other renewable sources produce no net greenhouse emissions and are technologies that should be supported, developed and implemented as expeditiously as possible. Additional attention should be given to the development of closely allied technologies such as hydrogen fuels, energy storage, and electric vehicles.

- Because there are large differences among fossil fuels in the amount of carbon dioxide released when they are burned, any legislative and regulatory barriers to fuel switching should be removed. Since natural gas produces only half as much carbon dioxide as coal, fuel switching or co-burning of natural gas with coal significantly reduces

greenhouse emissions as well as other conventional pollutants.

- While nuclear power does not generate greenhouse gas emissions, many things need to be done before nuclear power can compete economically and gain public and investor support. Therefore, this technology is unlikely to make any substantial additional contribution to our energy mix in the near future. For the longer run, efforts should be directed at demonstrating safe waste management and at research on inherently safer reactor designs (without plutonium recycle). This research should be undertaken with shared financial support from the nuclear industry.

3. In general, federal policy should promote environmentally and economically honest energy prices. Appropriate measures include removal of remaining subsidies for fossil fuels and nuclear power, adoption of the gasoline tax and related measures previously mentioned, and serious consideration of the "carbon dioxide emissions charge" proposal now being studied by the Congressional Budget Office and others (see Section III).

VII. CONSERVING TROPICAL FORESTS AND BIOLOGICAL DIVERSITY

The world's tropical forests are being destroyed so fast at this moment—the conservative estimate is 54 acres each minute—that unprecedented global action should be taken. As these forests are cut down, thousands of plants and animals are lost forever. The planet's greatest storehouse of biological diversity is its tropical forests, and if current destruction continues, hundreds of thousands of species will become extinct by the year 2000.

Although most tropical forests are in the developing countries, the United States cannot afford to take the role of a disinterested observer. The genetic resources in these forests are important to U.S. agriculture because plant breeders must periodically return to the wild source for disease-resistant or drought-resistant genes. The forests are vital to medicine, since one fourth of all prescription drugs are derived originally from plants, and scientists have barely begun to analyze the millions of species found in tropical forests. Industries have been built on forest products, such as rubber and other extracts, resins, and dyes.

Lost genetic resources aside, forests cannot be razed without major environmental side effects. Once the forest cover is gone, nothing blunts the force of torrential rainfall, allowing erosion to strip the thin soils and to carry sediments downstream to degrade fisheries, silt up reservoirs, and clog irrigation systems.

Deforestation is also affecting the world's climate. Carbon dioxide—the principal greenhouse gas—and methane are released into the atmosphere when trees are cut and burned, or decay, adding to the heat-trapping effect. An estimated fifth of carbon dioxide emitted annually results from deforestation.

The causes of deforestation are inseparable from developing countries' major problems. Population pressures, poverty, and inequities in land tenure all lead to clearing new land, and pressure to generate foreign exchange for debt payments is seen to justify mining forests and converting forested land to cash crops and cattle ranches. Many government subsidies stimulate forest destruction at public expense.

America's concern for wildlife and endangered species now extends to the rainforests themselves and to their people. The U.S. response must thus take into account the economic aspirations of the

poor in the tropics. As the industrialized nations recognize their interest in conserving tropical forests, which poorer countries feel forced by economic circumstances to exploit, there must be a joint commitment on the part of the United States and other countries to make conservation and development part of the same process.

“The world's tropical forests are being destroyed so fast at this moment—the conservative estimate is 54 acres each minute—that unprecedented global action should be taken.”

Many actions need to be taken if the United States is going to contribute importantly to addressing these challenges:

1. Several positive initiatives currently under way within the development assistance community need to be strengthened and strongly backed by the United States. In particular:
 - United States officials should push for a swift end to development assistance projects and programs, both bilateral and multilateral, that directly or indirectly promote deforestation or damage critical areas of high biological richness.
 - Emerging efforts within the development assistance community to fund biodiversity and tropical forest conservation projects should be vigorously supported.
 - The United States should encourage the full funding and implementation of the "Tropical Forestry Action Plan," developed by the World Bank, the U.N. Food and Agriculture Organization and others to reduce deforestation and promote the sus-

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Emerging efforts within the development assistance community to fund biodiversity and tropical forest conservation projects should be vigorously supported.
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tainable use of tropical forest resources. Efforts should be made to strengthen implementation of the plan in key areas: ecosystems conservation, protection of indigenous peoples, and participation of non-governmental organizations.

2. The United States should work with other countries to promote the goal that tropical hardwoods be imported only from areas where sustained yield management is practiced. The International Tropical Timber Organization could provide the framework for this cooperation and should have U.S. backing.
3. Working with developing countries directly and through multilateral agencies, the United States should seek reform of current economic policies that encourage deforestation, such as below-market timber sales and tax breaks and subsidized interest rates for development in forested areas.
4. Beyond the foregoing measures, major new initiatives will be needed if remaining tropical forests and biodiversity are to be conserved. The United States should lend its strong support to the exploration and development of the following ideas, among others:
 - In order to achieve a sharp increase in funding for biological conservation in developing countries, new financing mechanisms and facilities should be identified and tested, including expanded use of debt-for-nature swaps, the creation of new financial

intermediaries, and the establishment of new conservation funding facilities, perhaps associated with existing international organizations such as the World Bank.

- The policy agenda adopted as part of any overall or broad-based Third World debt relief or restructuring should include specific measures to conserve tropical forests and critical ecosystems.

- If efforts to save species and biological diversity are to succeed, a more coordinated, systematic, and aggressive international effort is needed. To fill this need, plans are now under way to develop a "Global Strategy for the Conservation of Biodiversity" and an international convention on biodiversity. The global biodiversity strategy will seek to galvanize interested parties in both industrial and developing countries around an agreed-upon international plan of action. U.S. agencies should play a leading role in shaping and promoting these important initiatives.

- Serious exploration should be given to the idea of an international convention to protect the world's remaining tropical forest areas. Such a convention could be the vehicle for bringing about a "global bargain" in which the national interests of the industrial countries in slowing global warming and protecting world biological resources, both promoted by halting deforestation, are reflected in relief and forgiveness of Third World external debt. A list of fifteen tropical countries in Latin American, Asia and Africa contains virtually all of the major debtor countries as well as the countries experiencing extensive deforestation. A debt-for-nature bargain among these countries and the industrial countries would promote long-term national interests North and South.

(Other initiatives that will help in the effort to conserve world biological resources are discussed in Section VIII.)

VIII. HALTING ENVIRONMENTAL DETERIORATION IN DEVELOPING COUNTRIES

Third World countries' efforts to develop, supported partly by international assistance, have brought impressive economic growth to some countries, along with substantial gains in health, life expectancy, and education. Such efforts have also brought modest industrial and agricultural increases to many countries. Yet, all around the world, poverty remains a crushing burden.

The worldwide recession and debt crisis of the 1980s have reversed economic growth in many countries, and slowed it in others. Even though the birth and death rates have dropped in most countries, in absolute numbers population continues to rise, putting heavy pressure on all natural and financial resources.

Why have many poor countries failed to grow adequately? The reasons are numerous. Wide swings in world commodity prices, currency fluctuations, weak or corrupt institutions, inadequate training, mistaken government and donor policies, inequity, and political instability are among them. But, perhaps the most underappreciated factor until recently has been the mismanagement of natural resources.

Developing countries are many times more dependent than industrial countries on their natural resource base—their soils, water, fisheries, forests and minerals. And within countries, the poor are the most dependent of all. Yet this resource base is eroding rapidly today, and development prospects are being undermined as a result.

Some development projects have had major costs. The construction of roads into the Amazon and unsustainable agricultural settlement that follows is often given as an example. More common are the effects of heavy or otherwise inappropriate uses of fragile highlands, drylands, and forests—overgrazing, overcutting, and overfarming until the resource base has eroded away. Ultimately, such overuse contributes to famine (as in Ethiopia), to devastating floods (as in Bangladesh), and similar tragedies.

To promote progress in the 1990s, the United States must apply the lessons of past decades. First, environmental damage bears high development costs. Second, to be economically sustainable, development must be environmentally sustainable. Third, development strategies must emphasize natural resources. Resource sectors—agriculture, forests,

fish and wildlife, minerals, and energy—generate at least half the gross national products of many developing countries. These sectors provide more employment and export revenues than any other, and the resources' natural limits must be respected in development plans if they are to be productive in the next century.

The United States, until this year the largest donor of development assistance, should provide international leadership in unifying environmental protection, resource use, and development. The key to an effective program is the concept of "sustainable development"—development that maintains and enhances human and physical productive capacity without damaging the underlying resource base. This approach will require refocusing bilateral aid and influencing multilateral agencies.

Important initiatives need to be taken to help reverse environmental deterioration in developing countries:

1. The time is auspicious for a thorough overhaul of U.S. international cooperation based on a new concept of burden-sharing to sustain our earth and its people. The U.S. should make the linked challenges of mass poverty and environmental decay the primary

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The U.S. should make the linked challenges of mass poverty and environmental decay the primary focal points for U.S. cooperation and assistance in the Third World and the primary objectives of a rewritten Foreign Assistance Act.
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focal points for U.S. cooperation and assistance in the Third World and the primary objectives of a rewritten Foreign Assistance Act. The two overarching goals should be, first, to promote people-oriented development that provides sustainable, non-destructive

tive livelihoods for the rural and urban poor and, second, to promote environmental protection that conserves the resource base for long-term production, protects public health, and establishes a sound basis for international cooperation on global environmental challenges.

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U.S. efforts should support strengthening and training personnel responsible for resource management in developing countries, working with non-governmental organizations to improve local capabilities for resource management, and developing scientific research and monitoring capabilities for resource and environmental management.

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2. In promoting its development assistance activities through both bilateral and multilateral channels, U.S. policy and initiatives should focus on the following objectives:

Agriculture: assisting marginal farmers missed by the Green Revolution, promoting land tenure reform, reducing dependence on agricultural chemicals and encouraging biological fertilization and integrated pest management, reclaiming degraded lands, managing and maintaining irrigation systems better, promoting agroforestry as well as ecologically sound animal husbandry, and involving local farmers—including women—in the design and implementation of programs.

Forestry: supporting reforestation, restoring fuelwood supplies, combining forestry and farming (“agro-forestry”), conserving natural forest areas and promoting better management of tropical forest ecosystems, preserving forest resources for indigenous peoples, and promoting watershed rehabilitation and appropriate forest-based industries.

Energy: focusing on the energy needs of the urban and rural poor, supporting efforts to use traditional fuels more efficiently (through the development and marketing of improved cooking stoves, kilns, furnaces and boilers used in local industries), and improving the “modern” sector through more efficient generation, least-cost energy planning, and the application of such renewable resource technologies as biomass, small-scale hydro, and solar energy.

Population: substantially increasing access to family planning services and improving health care and educational opportunities, especially for women and children. The United States should resume its world leadership in promoting family planning and contraceptive research, restore its financial support to the U.N. Fund for Population Activities, and promote an international goal of a transition to a stable world population of about nine billion by the middle of the next century.

Policy reform: identifying and removing those economic subsidies in agriculture, forestry, energy and other sectors that encourage poor resource use and also impose heavy fiscal burdens on governments (e.g., pesticide subsidies, heavily subsidized irrigation, tax breaks for forest clearing, and artificially low energy prices).

Capacity building: strengthening and training personnel responsible for resource management in developing countries, working with non-governmental organizations to improve local capabilities for resource management, and developing scientific research and monitoring capabilities for resource and environmental management.

3. The overall amount of U.S. aid for sustainable development should be expanded while new financial sources of investment and increased funding for programs of global environmental significance are sought. These could include:

- Developing funding mechanisms for converting commercial bank and governmental debt into conservation and other sustainable development endowments;

- Revising tax and accounting rules to make it easier for commercial banks to donate debt for sustainable development programs;

- Providing debt relief and forgiveness for the poorest countries, including many in Africa; and,

- Redressing the imbalance between development assistance and military assistance,

which is proportionately larger today than at any time since the Vietnam War.

4. The United States should encourage the revision of current methods of national income accounting which give badly misleading reports of economic growth by failing to treat resource depletion as capital depreciation is treated.

Mr. SPETH. I would like to underline, Mr. Chairman, that we have one decade left to deliver a planet whole and sustained to the new century and, indeed, to the new millennium. It is the last opportunity we have to reverse in this century the deterioration of our global atmosphere and the deterioration of the planet's environmental and biological resources that Russ Train has identified for us.

So, I hope that one of the things that this committee can do and that the Congress can do and that the administration can do is to put their full weight behind the establishment of an international environmental decade for the 1990's, a decade of concerted action during the 1990's, that would involve reaching out with other countries to find the joint solutions that will be essential if we are going to bring global warming under control and at the same time preserve the planet's rapidly eroding biological base. There are no two objectives, I think, that are more important than those two for this country and for this Congress.

I want to touch on four areas where I would specifically urge your attention.

The first is that I would urge this committee to develop and to report out a major piece of legislation which might be called a global environmental policy act or an international environmental cooperation act. Twenty years ago the Congress wrote the National Environmental Policy Act. Today we need an environmental policy act and an international environmental cooperation act to deal with the great international issues, the global issues, that confront us, issues which are not really addressed well in the National Environmental Policy Act. It is a very appropriate thing for this committee to take up.

We need a charter for U.S. action and cooperation on global issues, a legislative charter. It could declare basic U.S. policy on global environmental issues. It could establish what the priorities are.

It could make these policies and priorities integral parts of the mandates of Federal agencies, including agencies that deal with international affairs, economic policy, trade, international debt, development assistance and scientific research and technological transfer.

It could establish mechanisms for executive branch leadership and coordination and action.

It could put into law action-forcing requirements so that Congress can monitor the progress of our Government on these vital issues.

And last, it could provide programs to make U.S. technical assistance and other cooperation and aid available to the developing countries of the world, many of which have "graduated" from our

AID foreign assistance program. I'm thinking of programs of cooperation, for example, with Brazil and other countries with income levels higher than the AID cutoff levels but still in desperate need of cooperation on an international basis to solve global environmental problems.

The second point is that we have no time to waste in addressing the global warming issue. It is more appropriately referred to as the global heat trap problem rather than the greenhouse effect.

We need clear, strong U.S. leadership in the development of an international convention to address the global warming issue. No one country can address the global warming issue alone. There needs to be an international framework that spans north and south, east and west, like the international framework convention that we have in place now to protect the ozone layer. And it should be addressed to the greenhouse effect. Right now we don't have that framework convention, and we need to develop one. And this committee could certainly play a major role in encouraging that.

We also need to recognize that over one-half of the greenhouse gases come from the energy sector, and that the United States is the most wasteful user of fossil fuels, which produce these greenhouse gases, in the world. And the United States will be unable to lead effectively on the international level unless it makes a commitment to a new energy policy. The world, and particularly developing countries, are unlikely to act to save their forests, for example, because of their contribution to global warming or to act to improve their energy efficiency unless the United States, the most wasteful user of fossil fuels in the world, is also acting in its domestic environment to give energy leadership.

Mr. Chairman, U.S. energy policy has become U.S. foreign policy.

The main step that we can take in this country to give international leadership are efficiency improvements leading to fossil fuel use decline in the United States. The technology is available to dramatically improve our efficiency in the use of fossil fuels and to catch up with the Japanese and the West Germans and other countries on this, and in so doing, to reduce our total fossil fuel use and provide the basis for international leadership on the greenhouse issue.

In this respect, I would like to applaud the chairman and the other Members of the Senate who recently wrote President Bush and urged a 20-percent reduction in our fossil fuel use or carbon dioxide emissions.

We are unlikely to achieve that reduction or any reduction in fossil fuel use unless we are willing to put the economic incentives in place to do it. Regulation will be an important part of it, but we will need economic incentives such as a gasoline tax or a carbon dioxide emission fee.

Third, Mr. Chairman, Congress must act to make the United States a leader in an international effort to stem the tragic loss of biological resources. As Mr. Train has appropriately said, most of these resources are in the developing countries.

But I think we have to get serious about asking ourselves, if we really want to stop deforestation or bring it to a near halt, if we really want to save the world's biological resources, which are disappearing today at thousands of species a year, what is it going to

take. We are not doing the right things now. We haven't reversed or even materially slowed the trends. What will it take?

I think that the solution, when it does unfold and is developed, will involve a global bargain of sorts. Whether we label it that or whether we negotiate at one time or in 100 pieces, it will in effect be a global bargain between the north and the south.

In the south we have the great forests that need preserving. We have the biological wealth. We have tremendous poverty and underdevelopment, and we have the most rapid rates of environmental decay.

In the north we are the creditors. We control the debt situation. In the north we have the financial resources to play a major role in addressing these environmental and poverty problems in the Third World. And in the north we have the technology and the know-how to put our shoulder to the wheel and get something done.

We have to bring these elements together in a bargain between the north and the south.

Some elements of that are already visible. Mr. Train has mentioned the debt-for-nature swaps. The ones that have occurred so far are very important, but very small in relationship to either the debt that is out there or to the biology and the biological resources that need to be conserved. We need to find ways to greatly expand and build on the small debt-for-nature swaps that have occurred so far.

We need new financial resources to fund conservation projects in developing countries. The tropical forestry action plan that is being carried out now by the development assistance agencies is a step in that direction. But unless we are able to tap major new resources with a facility dedicated to funding conservation initiatives in developing countries, perhaps a facility adjunct to the World Bank we will never command the resources that are needed to reverse these tragic trends that are occurring.

And, Mr. Chairman, I would simply urge that you and others look to the east and join in a cooperative effort with the Japanese who are, indeed, beginning to think in these terms and about the establishment of an IDA-type facility, perhaps adjunct with the World Bank, to provide the funding that is needed to carry out this decade-long strategy of reversing these tragic trends.

We need an international biodiversity action plan.

We need programs of transferring available technologies to the Third World at a reasonable price.

The last point I would like to make, Mr. Chairman, is that we need to completely rethink and reinvent the national and international institutional arrangements. The arrangements for dealing with this problem go back at least 20 years. Many go back much further. They evolved in a period where the seriousness of global resource and environmental issues was not appreciated and in which the need for concerted international action was not present. I want to highlight four things in this institutions area for you.

The first is that we need a reauthorized Foreign Assistance Act. The act that we have today is a gerryrigged structure which is not up to the job. And, Mr. Chairman, I believe that there is a tremendous support in this country for international cooperation and foreign assistance if we are tackling the right problems with our pro-

gram. If we are going after world poverty, if we are going after saving the global environment, then I believe that a foreign assistance act will command tremendous support in this country. But we have to alert people to the fact that that's what we're doing.

Second, we need to strengthen the U.N. Environment Programme, and we need to strengthen the U.N. system and the programs in the U.N. system for dealing with these issues. I join with Mr. Train in urging a doubling or more than a doubling of the funding available for the U.N. Environment Programme, but we probably also need some larger role for UNEP or some other U.N. body to coordinate the U.N. activities at the level of the headquarters in New York.

Third, we need to improve the World Bank's environmental performance to build on the strides that have been made at the World Bank. The multilateral development banks can be a tremendous source for reform in energy, in biological conservation and in other areas. And we have to work together to establish new programs for the World Bank and the other MDB's.

And last, we need to focus more on the Office of Oceans, Environment and Science in the State Department. Environmental diplomacy will become one of our most important forms of diplomacy in the 1990's. And the Office of Oceans, Environment and Science and the assistant secretary that runs it will become institutions of tremendous international and national importance. I think we need to be sure that that office is adequately staffed and that training is available for our diplomats to carry out the international environmental diplomacy of the 1990's.

Mr. Chairman, if we do these things, I think the opportunity is there to reverse the tragic trends that we confront. If we don't, we and our children are going to pay dearly.

Thank you very much.

[The prepared statement of Mr. Speth follows:]

PREPARED STATEMENT OF JAMES G. SPETH

Mr. Chairman and members of the committee, I am Gus Speth, President of the World Resources Institute. WRI is an environmental research and policy analysis group, established in 1982 to develop and assess policy options on global environmental issues.

I thank you for inviting me to share my thoughts and recommendations on the critical components of an international environmental agenda for the 101st Congress.

Your attention to such an agenda could not be more propitious. The world's environment is in trouble. The buildup of carbon dioxide and other gases in the atmosphere threatens far-reaching climate change. One class of these gases, chlorofluorocarbons, is also depleting the Earth's ozone layer, which shields us from the sun's ultraviolet radiation.

In the developing world, pressures on natural resources intensify daily. The deserts expand while the forests, with their immense wealth of life forms, retreat. An acre of tropical forest disappears every second. Hundreds of millions of people live in absolute poverty, destroying the resources on which their future depends because no alternative is open to them.

These global environmental issues are closely interlinked, planetary in scale, and deadly serious. Solutions will require both unilateral actions on the part of the United States and other countries as well as major multilateral cooperative efforts. They will not yield to modest commitments of resources in the face of a doubling of world population and a quintupling of world economic activity in the lifetimes of today's children.

In recognition of this grave challenge, the nations of the world must come together in a way perhaps unprecedented save in wartime. They should declare that a priority mission of international cooperation and diplomacy in the 1990's will be to deliver a gift to the new century of a planet sustained and whole.

While leaders around the world... George Bush, Margaret Thatcher, Mikhail Gorbachev, Rajiv Gandhi... have publically acknowledged the seriousness of these global environmental issues, a comprehensive international response on a scale equal to the challenge is lacking. With the commitment by President Bush and others to host high-level international conferences on global environmental issues in 1989, the United States and other nations have an opportunity to do something of historical importance.

To provide a framework for longterm, concerted international action, the Congress and the President should jointly declare and seek the support of other nations in launching an

INTERNATIONAL ENVIRONMENTAL DECADE...

a ten year action plan dedicated to stimulating and coordinating domestic and international commitments on global environmental issues. The U.S. Government should play a leading role to :

- **REDUCE GLOBAL EMISSIONS OF GREENHOUSE GASES**
- **PHASE OUT MANUFACTURE AND USE OF CHLOROFLUOROCARBONS**
- **LAUNCH AN INTERNATIONAL PROGRAM TO PRESERVE THE EARTH'S BIODIVERSITY**
- **LAUNCH AN INTERNATIONAL PROGRAM TO REVERSE DEFORESTATION**
- **TRANSFER NON-POLLUTING TECHNOLOGIES TO DEVELOPING COUNTRIES**
- **ENHANCE THE CAPACITY OF THE UNITED STATES, DEVELOPING COUNTRIES, AND INTERNATIONAL INSTITUTIONS TO ACT ON GLOBAL ENVIRONMENTAL ISSUES.**

Mr. Chairman, recognizing that the Congress and the new Administration would be asking the same question you have posed to us today, WRI recently prepared a short report summarizing the findings and policy ideas that have emerged from our research over the past several years. This report, The Crucial Decade: The 1990's and the Global Environmental Challenge, contains additional information on many of the actions recommended in my statement, and I respectfully ask that you include this report in the record of these hearings.

REDUCE GLOBAL EMISSIONS OF GREENHOUSE GASES

Carbon dioxide, the largest contributor to the greenhouse effect, is a gas emitted when fossil fuels are burned and is the chief culprit among the greenhouse gases which trap heat in the atmosphere. Ozone, methane and nitrous oxide are also greenhouse gases. All three are linked to fossil fuel use, but methane and nitrous oxide are also released in agriculture and forestry. Another contributor is chlorofluorocarbons.

If the buildup of greenhouse gases in the atmosphere is not halted, global warming will bring major climate changes. Regional impacts are difficult to predict exactly, but rainfall and monsoon patterns could shift, disrupting agriculture in many areas. Sea levels could rise, flooding coastal areas. Ocean currents could shift, further altering the climate and fisheries. Fewer plant and animal species could survive as favorable habitats are reduced. Heatwaves, droughts, and other weather anomalies could harm susceptible people, crops and forests.

While emissions of greenhouse gases must be significantly reduced by all the industrialized nations, it is important to note that the United States emits about 25 percent of the world's carbon dioxide and nitrogen oxide emissions.

On the national level:

- Congress should declare global warming a national priority and commit to preparing and carrying out an aggressive and comprehensive energy plan. This plan should establish energy policies that: 1) improve the efficiency with which the United States uses energy; 2) cause a switch to natural gas and other fuels that produce comparatively less carbon dioxide; and 3) foster the development of non-fossil sources of energy such as solar and other renewable technologies both for our own use and equally important, for meeting the needs of developing countries. the United States is the largest producer of CO₂. Unless the United States changes its energy policy to make the reduction of carbon dioxide emissions a national priority, other nations will not respond to the threat of global climate change. U.S. energy policy is becoming U.S. foreign policy.
- Congress should require that the United States complete an intensive review of a "carbon emissions charge" proposal that would impose a fee on suppliers of fossil fuel (coals, oil, and natural gas) proportioned to the carbon dioxide released when the fuels are burned. This charge could reduce carbon dioxide emissions by providing incentives to energy sources that produce less or no carbon dioxide. Proceeds from the charge could be applied to investments that would: enhance United States competitiveness in international markets, provide rebates to lower income energy consumers, aid deficit reduction, and support programs to promote forest conservation and reforestation globally. Moreover we should consider establishment, on an international basis, of a "global environmental fund" with financing in part from fees on greenhouse gas emissions.
- Development assistance programs supported by the United States should promote energy efficiency and the use of renewable energy supply technologies.
- The committee should hold an oversight hearing to determine the Administration's progress in meeting the requirements of the Global Climate Protection Act. As you know, The Global Climate Protection Act was passed by this committee as an amendment to the State Department Authorization Act and was enacted in late 1987. An important goal of the Act is the stabilization of the concentration of atmospheric greenhouse gases. The President is responsible for developing and proposing to Congress a coordinated national policy on climate change. No such national policy has been presented to Congress to date.

On the international level, I urge consideration of a two-tiered approach:

- Without awaiting full international agreement, the United States should lead the way in forging an industrial country agreement to achieve reduced emissions from the energy sectors of major industrial countries that are responsible for most of the greenhouse gas emissions. It might focus on only the energy sector and address energy pricing and a carbon emissions fee.
- The United States should also take the lead in pursuing a global framework convention on climate change and also a protocol on the reduction of greenhouse gases.
 - A global convention should involve all nations, all greenhouse gases, and should include both prevention and adaptive actions.
 - International and national goals and responsibilities should be identified in a manner that facilitates performance monitoring.
 - Developing countries, which contribute about a fourth of current greenhouse gas emissions, should be encouraged to participate through appropriate assurances and incentives.

PHASE OUT MANUFACTURE AND USE OF CHLOROFLUOROCARBONS

In the stratosphere, ozone filters harmful ultraviolet radiation, forming a shield around the planet. Weakening this shield invites more skin cancers and eye disease, a reduced immune response, and harm to plant and animal life. Chlorofluorocarbons (CFCs) found in aerosol cans, refrigeration systems, and blown-foam materials, rise into the stratosphere and destroy some of the ozone.

CFCs also contribute to the greenhouse effect. Molecule for molecule, CFCs can be 10,000 times as efficient as carbon dioxide in trapping heat in the atmosphere.

In 1987, led by the U.N. Environment Programme, governments around the globe agreed to the Montreal Protocol, which would halve CFC use in the industrial countries by 1999. But given the latest evidence of damage, it is now widely held that much greater reductions will be necessary both for the sake of the ozone layer and to slow the rate of global warming.

Accordingly in early March the 12 countries of the European Community agreed to phase out all CFCs by the year 2000. I was pleased to see that William Reilly, Administrator of the U.S. Environmental Protection Agency announced U.S. support for a phase out by the end of the century, at a 123 nation conference hosted by Prime Minister Margaret Thatcher.

The signers of the Montreal Protocol will meet in Helsinki in May to decide whether or not to recommend tightening of the provisions at a review conference to be held in London in April 1990.

On the national level:

- The federal government must fashion a combination of market and regulatory strategies that will eliminate the use of CFCs in the most cost effective and least disruptive manner.

On the international level:

- The United States should exhibit international leadership to gain agreement to more rapidly eliminate CFC's.
- The United States should support the renegotiation of the Montreal Protocol to accomplish a complete global phase out of fully halogenated CFCs by the year 2000. The Protocol should be expanded to address other ozone depleting compounds not now covered.

LAUNCH AN INTERNATIONAL PROGRAM TO PRESERVE THE EARTH'S BIOLOGICAL DIVERSITY

The world is being impoverished by the erosion of its most fundamental capital stock -- its species, habitats and ecosystems. The pace at which these are being lost in recent decades is unmatched in the past 65 million years.

Tropical deforestation will be the single greatest cause of species extinction in the next half-century. The decline of forest resources in tropical regions, the degradation of coral reefs, and the loss of wetlands throughout the world have seriously diminished important ecological resources.

It should no longer be acceptable merely to slow the loss of biodiversity; we must bring biotic impoverishment to a halt. Many organizations are currently working to this end, but these efforts are too fragmented to bring about fundamental change.

The challenge facing us is to maintain the world's biodiversity while using it wisely to help provide for human well-being today and in the future. If efforts to save species and biological diversity are to succeed, a more coordinated, systematic, and aggressive international effort is needed. Meeting this challenge will require the U.S. to exhibit strong leadership in the international community, and with other industrialized countries, to provide adequate assistance to developing countries.

I recommend that Congress should aggressively pursue the following actions:

- Call for a swift end to development assistance projects and programs -- both bilateral and multilateral -- that directly or indirectly promote deforestation or damage critical areas of high biological richness, and support development assistance efforts that help conserve biodiversity and protect critical ecosystems;
- Actively support the work on an International Biodiversity Convention currently under development by the United Nations Environment Programme and the International Union for the Conservation of Nature and Natural Resources; and
- Assure that the United States plays a leading role in shaping and promoting a "Global Strategy for the Conservation of Biodiversity," a plan underway by the World Resources Institute and the International Union for the Conservation of Nature and Natural Resources. The strategy will seek to galvanize interested parties in both industrialized and developing countries around an agreed upon international plan of action. United States agencies should play a lead role in shaping and promoting these important initiatives.

LAUNCH AN INTERNATIONAL PROGRAM TO REVERSE DEFORESTATION

The world's forests are being destroyed at a conservative estimate of 54 acres each minute. The planet's greatest storehouse of biological diversity is its tropical forests, and if current destruction continues, hundreds of thousands of species will become extinct by the year 2000.

As these forests are cut down, the people of developing countries are deprived of leading sources of livelihood; food, fodder and fuelwood, and cover that protects soils.

The causes of deforestation are inseparable from developing countries' major problems. Population pressures, poverty, and pressure to generate foreign exchange for debt payments are seen as justification for mining forests and converting forested land to cash crops and cattle ranches. In many countries subsidies stimulate forest destruction at public expense.

Although most tropical forests are in developing countries, the United States cannot afford to take the role of a disinterested observer. America's concern extends to the rainforests themselves and to the people who depend on them for their livelihood.

As the industrialized nations recognize their interest in conserving tropical forests, which poorer countries feel forced by economic circumstances to exploit, there must be a joint commitment on the part of the United States and other donor countries to make conservation and development part of the same process.

A successful program to halt deforestation must have major participation by developing countries and adequate political and financial support. What is needed is an international action plan, led by leaders of developing countries and supported financially and otherwise by industrialized countries. Only then will we be able to achieve a dramatic reduction in the rates of deforestation.

- Through our bilateral assistance program and through the multilateral agencies, the United States should seek reform of current economic policies that encourage deforestation, such as below-market timber sales and tax breaks, and subsidized interest rates for development in forested areas. We should strengthen the United States' ability to ask other nations to reform forest policies by removing our own subsidies of below-cost timber sales, such as those in the Tongass National Forest of southeast Alaska.
- The United States should reaffirm its commitment to the Tropical Forest Action Plan, International Tropical Timber Organization, and strengthen its support for the Food and Agriculture Organization and the Development Programme of the United Nations.
- In order to achieve a sharp increase in funding for biological conservation in developing countries, new financing mechanisms and facilities should be identified and tested, including expanded use of debt-for-nature swaps, the creation of new financial intermediaries, and the establishment of new conservation funding facilities, perhaps associated with existing organizations such as the World Bank.
- The policy agenda, adopted as part of any overall or broad-based Third World debt relief or restructuring, should include specific measures to conserve tropical forests and critical ecosystems.
- The United States should give serious consideration to pursuing an international convention to protect the world's remaining tropical forest areas. Such a convention could be the vehicle to bring about a "global bargain" in which the national interests of the industrialized countries, in slowing global warming and protecting the world's biological resources, are reflected in relief and forgiveness of Third World debt and in increased financial resources for conservation and sustainable development in developing countries.

TRANSFER NON-POLLUTING TECHNOLOGIES TO DEVELOPING COUNTRIES

A visit to many developing countries quickly shatters the myth that polluting technologies are predominately a problem of highly industrialized countries. Cities in the Third World are consistently more polluted with sulfur dioxide and nitrogen dioxide and particulates than most cities in the industrialized countries.

It took all of human history to grow to the \$600 billion world economy of 1900. Today the world economy grows by more than this amount every two years. By the middle of the next century, our world of five billion people will likely double to one of 10 billion and our global economy of \$14 trillion will likely be five times as large as today.

What does this mean? If industrial wastes and pollution grow at this expansive rate, our resource base will be strained to its limit. We must take action now to reconcile the economic and environmental goals that societies have set. Clearly, technological change is a major part of the answer.

- Congress must begin now to encourage the development of non-polluting, environmentally friendly technologies in both the industrialized and developing world that will be essential to the world's economic growth in the next century.
- In conversations with leaders in developing countries and the centrally planned economies, one repeatedly hears statements to this effect . . . we recognize the seriousness of the atmospheric and other problems you mention, but if we are going to join with you in solving these problems we will need access at costs we can easily afford to the solution-oriented technologies, for example, CFC substitutes and renewable energy systems . . . I believe such views are widespread and sincerely held. They raise a serious and legitimate issue - one that deserves to be seriously investigated by the Congress and others with an eye to finding a way to ensuring that those who do want to respond positively to global challenges have the technological means to do so.

ENHANCE THE CAPACITY OF THE UNITED STATES, DEVELOPING COUNTRIES AND INTERNATIONAL INSTITUTIONS TO ACT ON GLOBAL ENVIRONMENTAL ISSUES

A sound global economy and the need to carefully preserve the world's resource base will require the U.S. to reexamine its own institutional capacity to deal with these complex and cross cutting issues and at the same time exhibit international leadership to assess and recommend changes in international institutions such as the United Nations and multilateral assistance agencies and to assist developing countries to strengthen their capacities.

The complex issue of global warming will be a severe test of the capacity of national and international institutions to carry out environmental diplomacy. The challenge is to find the appropriate international framework that will establish a fair and effective mechanism for allocating reductions of greenhouse gases among nations.

I would encourage the Congress to take the following actions:

- Strongly support existing international institutions that can provide part of the answer. For instance, the Bush Administration has proposed a \$1.5 million reduction in the FY1990 appropriation for the United Nations Environment Programme, the very organization, that with the World Meteorological Organization, is the sponsor of the 30 nation Intergovernmental Panel on Climate Change. Congress should increase substantially the United States contribution to the U.N. Environment Programme;
- Carry out an examination of the adequacy of the United Nations and other international arrangements addressing these issues. It seems likely, for example, that some strong, central, high-level body is needed in the U.N. system to provide coordination and priority attention;
- Support the Administration's full funding request for the World Bank in the amount of \$70 million in FY 1990 and an additional \$20 million for FY 1989 for payment in arrears with firm direction for greater consideration of environmental assessment, global warming, environmentally sustainable development, and resource conservation; and

- Evaluate the adequacy of present staffing and funding for the U.S. State Department's Office of Oceans, Environment and Science and U.S. EPA's Office of International Activities and other federal agencies to assure adequate support for emerging global environmental challenges.

With respect to the U.S. Development Assistance

- I would encourage this Committee to undertake a thorough review of U.S. international cooperation based on a new concept of burden-sharing to sustain our earth and its people in a new, overhauled Foreign Assistance Act. Congress has the opportunity to make the linked challenges of mass poverty and environmental decay the primary focal points for U.S. assistance to developing countries. The two overarching goals should be, first, to promote people-oriented development that provides sustainable, non-destructive livelihoods for the rural and urban poor and second, to promote environmental protection that conserves the resource base for long-term production, protects public health, and establishes a sound basis for international cooperation on global environmental challenges.
- In promoting its development assistance activities of both bilateral and multilateral organizations, U.S. policy and initiatives should focus on the following objectives:
 - **agriculture:** assist marginal farmers, promote secure access to land, reduce dependence on agricultural chemicals, reclaim degraded lands, manage and maintain irrigation systems better, promote agroforestry as well as ecologically sound animal husbandry, and involve local women and men in the design and implementation of programs;
 - **forestry:** support reforestation, restore fuelwood supplies, combine forestry and farming, conserve natural forest areas and promote better management of tropical forest resources for indigenous peoples, and promote watershed rehabilitation and appropriate forest-based industries;
 - **energy:** focus on the energy needs of the urban and rural poor, supporting efforts to use traditional fuels more efficiently and improving the "modern" sector through more efficient generation, least-cost energy planning and the application of such renewable resource technologies as biomass, small-scale hydro and solar energy;
 - **population:** substantially increase funding for voluntary family planning services and improve health care and education opportunities. The U.S. should restore its financial support to the U.N. Fund for Population Activities and promote an international goal of a transition to a stable world population of about 9 billion by the middle of the next century;
 - **policy reform:** identify and remove economic subsidies in agriculture, forestry, energy and other sectors that encourage poor resource use and also impose heavy fiscal burdens on governments; support the development of policies that provide incentives for sustainable development;
 - **capacity building:** strengthen and train personnel responsible for resource management in developing countries, working with non-governmental organizations to improve local capabilities for resource management and developing scientific research and monitoring capabilities for resource and environmental management.
- The overall amount of U.S. aid for sustainable development should be expanded while new financial sources of investment and increased funding for programs of global environmental significance are sought. These could include:
 - funding mechanisms for converting commercial bank and governmental debt into conservation and other sustainable development endowments;

- tax and accounting rule revisions to make it easier for commercial banks to donate debt for sustainable development programs; and
- debt relief and forgiveness, particularly for the poorest countries, including many in Africa.
- I would encourage you to support revision of current methods of national income accounting which give badly misleading reports of economic growth by failing to treat resource depletion as capital depreciation is treated.

U.S. Global Environmental Policy Act

The National Environmental Policy Act of 1969 provided a charter for the protection of our national environment. Twenty years later, the President and the Congress should work together on legislation that would provide a charter for U.S. policy and action to protect the global environment. This legislation should contain findings regarding the nature and seriousness of the principal international environmental threats; it should declare national policies on protection of the global environment; and it should make those policies and appropriate specific measures part of the mandates of federal agencies, including those agencies responsible for economic policy, trade, international economic assistance, and scientific research. The legislation should also provide the framework for coordination within the federal government for a sustained attack on global environmental problems.

Mr. Chairman, thank you for allowing me the opportunity to share my thoughts with the members of this committee. I believe that the program I have outlined today in the context of an International Environmental Decade, will bring about a more secure and economically sound world.

The CHAIRMAN. Thank you very much, indeed, and I appreciate the specific nature of your testimony and your suggestions. It sort of gives us a checklist. And I would like to see this 101st Congress be the one that had checked off each one of these points that are being recommended.

The UNEP one I think is especially significant, particularly when you recognize that the administration in the past has recommended zero funding for it, much less an increase. Congress has secured the increase from zero to about \$9 million, if my recollection is correct. The idea of going up to \$20 million I would strongly support.

Each of these, the tropical forest ones, the debt-for-nature, the sharpening of aid, the economic one, biological diversity, which I've been working on, reauthorization of clean air and national energy policy—every one of those we would like to adhere to. We just face the practical problems of the budget limitations, and recognizing while this is small potatoes compared to the big ticket items, there still is a tight budget.

Going to the biological diversity point, as the author of that section in the Foreign Assistance Act, what is your assessment as to the effectiveness of the program as it is being carried out at this time? And do you feel that the level of funding for it is reasonably adequate, if not, what should it be raised to?

Mr. TRAIN. Let me say by way of introduction, I think that the legislative push for inclusion of biodiversity in foreign assistance programs has been just of critical importance—critical importance. Although the level of funding is nowhere near enough, AID has

made significant headway I believe in implementing the intent of Congress and the mandate of the Foreign Assistance Act.

The World Wildlife Fund has participated in a number of AID biodiversity projects, and we are presently under a rather substantial contract. I think it is about \$13 million covering some 3 years in this area. So, we have developed a great deal of experience along with AID in this area.

I realize there is some desire on the part of many to get away from earmarking of this kind, and in concept I think I would agree that programs in AID should, as a matter of course, include emphasis on biodiversity, on the environment generally. But I worry, at least at the present time, that we may not be ready to abandon the earmarking technique.

Mr. SPETH. Mr. Chairman, on the biodiversity question, the legislation that you and others have supported is indispensable. It has provided a toehold—that's how I would look at it—in comparison with the scope of the problem and the rate at which we are losing biodiversity internationally. I think it is a start. It needs more funding.

We also need to go beyond the AID program itself and the other small programs that we have in the Federal Government and to think creatively about what really will be needed if we want to preserve the world's biological heritage. And we are not there yet. We need a decade-long, international strategy, well-funded, well-conceptualized, aimed at really trying to save those areas of high endemism and high diversity and preserve critical ecosystems. It has to have major leadership from developing countries. It has to be a bottom-up process as well as a top-down one.

But we can do that. People are thinking about trying to do that now, but we need the support of the U.S. Government.

The CHAIRMAN. Thank you.

There are a couple more questions here if we get through.

If it were possible to take concerted global action now to control the release of the greenhouse gases right away, what impact would this have, say, 50 years from now, one-half century from now, or is it already too late in your view?

Mr. SPETH. Mr. Chairman, I think it is probably too late to prevent all global warming. It is not too late to prevent the worst effects of global warming. And it is extremely important that we begin to act. The latest scientific estimate is that we have probably already committed the planet to about .7 to 2 degrees Celsius global average warming by virtue of current and past activities. That is a severe amount of warming if it is fully realized. However, the studies that we have done suggest that there are actions that could be taken which could prevent warming from substantially exceeding that amount. But we have to begin now.

Let me mention some of the things that are at stake. Sea level rise, in your State, in Senator Helms' State. Tremendous damage could be done to the coastal areas of the United States through sea-level rise.

The CHAIRMAN. What would be the effect if all the ice caps were melted, the Greenland ice cap and the Antarctic one. What would that raise the waters of the oceans to?

Mr. SPETH. Well, Senator, that would be a devastating effect. Many meters.

The CHAIRMAN. How many roughly?

Mr. SPETH. Well, it all depends on exactly what happens.

The CHAIRMAN. If all ice was melted.

Mr. SPETH. If all the ice was melted, I don't know, but I don't think there would be much left of what we think of as the coastline of the United States.

However, I don't think that's a reasonable prospect.

The CHAIRMAN. Maybe for the record, I think it would be interesting. That figure is startling. You might submit for the record what in your estimate it would be. Would it be 100 meters? Or let's say yards. People understand it more easily to my regret. A hundred yards or 1,000 yards?

Mr. SPETH. Let me get that for you, Senator. I would be delighted to.

[The information referred to follows:]

In April 1975 the World Meteorological Council of Scientific Unions estimated that if the polar glaciers are melted the sea-level rise would be approximately 70 meters—over 76 yards (see Untersteiner, 1975. "Sea Ice and Ice Sheets, Role in Climatic Variations" Appendix 7, GARP Publication Series 16 *Physical Basis of Climate Modelling*. World Meteorological Council of Scientific Unions. pp. 206-224).

Global warming could raise sea levels 1 foot in the next 40 years, and 2 to 6 feet in the next century.

The rise that might be associated with the disintegration of the West Antarctic ice sheet is approximately 20 feet.

Mr. SPETH. I would like to present it in three steps if I might.

One, what would be the sea-level rise associated with what is now projected to happen by the middle of the next century so it is not too futuristic. And that in itself could be from 1 to 3 feet, which is quite a serious amount of sea-level rise.

Second, we can look at what might happen if the west Antarctic ice sheet—a large piece of landed ice—were to disintegrate. That is a much longer term and more speculative proposition, but you would get even more sea-level rise by several meters.

And then we will also take a look at your question, which I think is much more longer term than even that, of how much ice is in fact, on land, landed in glaciers and ice.

The CHAIRMAN. And on the ice caps.

Mr. SPETH. Yes.

The CHAIRMAN. Thank you.

What procedure does the World Bank now follow to ensure that environmental concerns are adequately followed?

As you know, we put into law a provision that AID in its projects has to take into account environmental considerations and assessment tests. But I don't think—correct me if I'm wrong, there is any provision that requires the World Bank to do this. If I am incorrect in that, please let me know. If I am correct, what can we do to encourage the World Bank to adopt the same policies?

Mr. TRAIN. Well, it is my understanding that the bank does in fact in its own policy take environmental aspects of loans and projects into account in the planning process at an early stage. That is what is intended in the bank.

The CHAIRMAN. Does it do that in your view?

Mr. TRAIN. Well, I'd say imperfectly, but increasingly better.

The bank under Mr. Conable has made some major organizational changes. It has added environmental capabilities in each of the regional vice presidential areas in the bank. And that is extremely important. Until recently the bank had a central environmental office, but no explicit capability in the environmental field in the various program area, regional areas. And that has been changed. And I think that has been a very important contribution. So, the bank does have in place the capability to do a much better job.

The bank is also beginning to elicit the views of nongovernmental organizations in the recipient countries. As in the case with AID, as I mentioned in my statement, this is of extreme importance.

I think that the bank is moving ahead. It is certainly amongst the multilateral development banks the leader in this regard. It is moving ahead to do a much better environmental job, but it certainly still has a ways to go.

Mr. SPETH. Mr. Chairman, could I comment on that very briefly?

The CHAIRMAN. Please.

Mr. SPETH. There have been major changes in the structure and staffing of the World Bank. And things are certainly moving in a positive direction. I don't think there is any doubt about it. But to be honest about it, I find the progress disappointing. It is too slow and too little.

I understand that the debt issue hangs over the bank and the development assistance community in such a way that it inhibits creative thinking about a lot of these issues. But, nevertheless, we have to get move serious about these issues in the development assistance agencies and at the World Bank in particular.

They do need to do a better job of environmental impact assessment and consideration of alternatives, and I don't think they will ever do it properly unless these assessments are made public.

The CHAIRMAN. Thank you very much.

Now, another phenomenon has occurred in the last couple of years that pleases me very much. When I started out 25 or 30 years ago in the Senate, when you talked about international environment, people flapped their eyelids and wondered what you were talking about. And even the great organizations like the Sierra Club and the others, all they focused on was domestic environmental problems. And you can't have successful domestic problems without having some international aspects to them.

And I am delighted at the last about year or two years, they have gotten on the bandwagon and are pushing the international side because the international side is what is the most important of all.

I was struck with you, Mr. Train, when you stated in I think this subcommittee, May 1976, "Increasing international cooperation on safeguarding our life support systems is an urgent necessity. The alternative is to sit back and wait for global disaster to overtake us. International environmental cooperation must be an integral part of American foreign policy." But it sure proved hard to finally get it accepted as it has in the last year or two.

In that regard, I can't help but recalling the bureau in the State Department was originally set up, if my recollection is correct, as the Bureau of Oceans and International Environmental Affairs.

And to get that through was a hideous job. I remember trying to persuade Dean Rusk to do it for several years because it could be done by administrative order. The administration wouldn't do it, and now it is one of the few bureaus in the State Department set up by legislative mandate which gives it, if we would all use it, a little bit more muscle than even the geographic bureaus. And it is perfectly correct because the oceans are 70 percent of the Earth's surface and all the other bureaus 30 percent. That is a little flip, but it's a fact. And I just wanted to get a reaction from you both on that.

And also, I have been very interested for some years in the idea of an international environmental assessment treaty which would mean that if a nation engaged in an activity that is harmful to its neighbor or the global commons, the oceans, it then would have to pass muster with UNEP, and if UNEP could hold it up 30 days or so. Well, that doesn't sound like much, but if it could get accepted, it's getting the nose of the camel under the tent.

It's a little abnegation of sovereignty which is the main problem in international environmental affairs for nations to recognize that when it comes to environmental considerations, they have to lose a degree of sovereignty. This is a concern that we are just now maybe facing up to and many other countries are not facing up to. And I was just, as I say, interested in your reaction to that.

I also would like, incidentally, to support what you said about Mr. Conable. He is doing a grand job. It's excellent.

But how do you account the slowness with which the international environmental considerations have become publicly accepted, and also what is your reaction to the international environmental assessment treaty?

Mr. TRAIN. That first question is hard to answer. I think some of us who have been beating the drum for international environmental concerns as a higher priority have been frustrated by this fact over the years.

The quotation that you cite of mine back in 1976—I don't know where it comes from. It sounds very good to me today.

The CHAIRMAN. I think it was to this subcommittee. I'm not sure.

Mr. TRAIN. I'm sure it was.

And it has taken a long time to see the kind of attention that we believe it should be getting actually develop. It has been I think encouraging. President Bush during the campaign did put a great deal of emphasis on international environmental issues. Secretary Baker in his confirmation hearing before this committee gave a great deal of attention and a high priority to—

The CHAIRMAN. Spurred by some of the questions too.

Mr. TRAIN. Although I was not present, I had a representative here; namely my wife, who told me that more questions were asked by the members of this committee on environmental matters than on any other single subject. So, things are changing.

I would point just in a very parochial sense—and I do mention this in my prepared statement—that the membership of the World Wildlife Fund passed 600,000—this is in the United States alone—some while ago, and it is still growing quite healthily. And that is from about 25,000 10 years or so ago.

So, I think something is going on in this country in terms of public awareness of and concern for global environmental matters. And if that is the case, I think that this Congress will respond and the administration will respond. So, that's a very encouraging sign.

On the second part of your question—and I might add that is, of course, reflected around the world. We are seeing, I'd say, such unlikely environmentalists as Margaret Thatcher suddenly getting on the bandwagon along with Gorbachev, Mitterand, and Takeshita in Japan, and a number of others, all addressing this issue.

The CHAIRMAN. And the domestic organizations too like the Sierra Club and others have come along now and do share this interest. They just did not have it for a long time.

Mr. TRAIN. On the second point of your question, Mr. Chairman, on the international environmental impact assessment, I think it's a good idea. It may have some problems, as you yourself allude to, in terms of sovereignty in application. But I think the concept is a good one. And I think the world community has to start moving in this direction.

Mr. SPETH. Mr. Chairman, I have been from the days when I was chairman at CEQ a strong supporter of your proposal for an international environmental assessment.

I also would like just to underline that we are moving into a period where environmental diplomacy internationally and the leadership of the office which you mentioned at the State Department of oceans, environment and sciences could not be more important. And I think that requires a change in mind set, if you will, away from quiet bilateral diplomacy which is still going to be needed to the realization that we are moving into a period where international conventions will have to become far more common and far more important. And these international conventions require a new type of environmental diplomacy. Without them, we will never solve these problems.

The CHAIRMAN. I thank you both very much, indeed.

One final question. I think we all were at the conference in Stockholm in 1972. There has been a proposal for an international conference by the present administration. Are either of you aware of how far that suggestion has gone, when it would occur, in what year? Or is it all still just in the realm of wishful thinking?

Mr. SPETH. I think Mr. Train might be closer to that question than I am.

Mr. TRAIN. Closer to the question, but not the answer.

I don't think I could really give you much information on that. I know that it is not simply in the realm of imagination. It is being worked on in the administration I'm informed.

I think part of the problem is that there have been a number of conferences called around the world, and I think there is a strong feeling in the administration, which I certainly share, that what is needed is not simply more rhetoric on these issues. There has been a lot of rhetoric, and I think it has probably been good rhetoric and desirable, but the time for that has passed. The time for action has come. So, I think the administration, as I understand it, is grappling with that aspect to try to move ahead with a conference that will have concrete results.

The CHAIRMAN. And I think your checklist is an excellent checklist that both you gentlemen cited, and I would hope that the policymakers would read your testimony closely.

Thank you both very much, indeed, for being with us.

Mr. SPETH. Thank you very much, Senator.

Mr. TRAIN. Thank you, Mr. Chairman.

The CHAIRMAN. We now turn to Dr. Patrick Michaels and Dr. S. Fred Singer, both of the Department of Environmental Sciences, University of Virginia. Which one of you would like to lead off? Dr. Michaels, OK.

STATEMENT OF DR. PATRICK MICHAELS, DEPARTMENT OF ENVIRONMENTAL SCIENCES, UNIVERSITY OF VIRGINIA

Dr. MICHAELS. Thank you, Senator. I would like to thank the committee for inviting my testimony on the issue of anthropogenated climatic change.

My spoken testimony will reflect highlights with more extensive written text that has been submitted for your consideration.

The CHAIRMAN. The full text will be put in the record.

Dr. MICHAELS. Thank you.

One thing I have learned in my profession is how easy it is to make a forecast and how hard it is to be correct. And it is in that humbling light that I tender my views on the issue popularly known as global warming, or the greenhouse effect.

One hundred years ago the internal combustion had just been invented. A person with vision might have said that it would gradually replace the horse. No one would have believed him if he would have said that in the next 100 years people would fly through the air at 600 miles an hour over cornfields that yielded 150 bushels per acre.

As I write, there is mounting evidence that the energy of nuclear fusion may be harnessed in a device that is about as complicated as an electrified aquarium. If this is indeed true, technological changes over the next 100 years will dwarf those of the last century by orders of magnitude. Professor Singer can expand upon these in his following testimony.

Nonetheless, it is in that context that we attempt to steer not only our environmental and energy policy but that of other sovereign nations.

I have no quarrel with aspects of proposed legislation that emphasize the uncertainties related to this problem and propose an expanded research effort. Our policy should be commensurate with the state of our scientific knowledge. That knowledge currently suffers from a number of important inconsistencies in both our analysis of past climate and our projections for the future.

I do realize that concrete policy cannot require "perfect science" because such a thing will certainly never exist. However, with the great uncertainty that surrounds the climatic change problem, I agree with others that policymakers should pursue a portfolio of options—and I underline options—that will pay off in different future states.

Under that rubric, one of many options is that no action other than accelerated research could be the optimum policy.

I have speculated in the scientific literature that a revolution—by that I mean a drastic reordering of the accepted paradigm—may be occurring in the global warming issue. This is if we assume that the popular perception of corn belt desertification and tidal waves crashing through a Manhattan studded with palm trees is indeed what is currently accepted. I make that speculation in the light of recent research that I will detail in the rest of this brief testimony.

Carbon dioxide, methane, the chlorofluorocarbons and nitrogen oxides are all increasing exponentially in the atmosphere. These gases share the property of infrared absorption, and everything else being equal, which are very risky words in this business, they should serve to warm the atmosphere. If all of these radiatively active gases were expressed as if they were carbon dioxide—a rather simple calculation—the concentration of CO_2 could be expressed as 407 parts per million today. That is 151 percent of a preindustrial 19th century background of 270 parts per million. We have, in fact, gone effectively radioactively over half way to a doubling of carbon dioxide already.

Everything else being equal—and again, I caution you that it almost never is—the Earth should have warmed some 3.6 degrees Fahrenheit from these combined alterations of the atmosphere that we have caused. Temperature measurements, which themselves are the subject of controversy, place the warming at around 1 degree. While some of the “missing warming” this is the committed warming that we hear about—is being sequestered in the ocean, a large fraction may indeed simply be missing. At best it appears that the Earth has warmed up only half as much as it should have to date.

I'll now show a lot of Northern Hemisphere temperatures. It is traditional when one talks about the global warming problem to present graphs of global temperatures. Instead, I'm going to do it slightly different to illustrate some of the complexities that are involved.

These are Northern Hemisphere temperatures from the East Anglia record through 1987 beginning in the mid-19th century. The major trace gas emissions begin in the portion of the record after 1940. The warming that exists between 1850 and 1930 therefore has little, if any, to do with anthropogenerated trace gases. It is also clear that in the last 55 years there has been no net change in the mean temperature of the Northern Hemisphere.

Now, when we look at the Southern Hemisphere, things look quite a bit different. The argument is often made that the reason that we are not seeing the amount of warming we are supposed to be seeing is because it is being sequestered in the ocean. If that is true, one would logically expect that the Southern Hemisphere, which is 90 percent water, would be the one that would be slowest to warm and would display the most signals.

I could convince myself, looking at the Southern Hemisphere temperatures, that they indeed do have an exponential rise over the period of trace gas emissions, although that magnitude of that rise is surely less than one-half of what it should be.

Now, I want to take a look at another climate record to further underscore the complexity of this issue. I will talk first about the United States Climatological Division record which contains only a small urban effect, which is very hard to remove from the record.

It shows no change—repeat, no change—in mean temperature during the last 100 years. The argument has been tendered, and I agree with it, that this could certainly occur over such a small area as the United States is in the face of a general global warming. However, studies over Canada and my own mean temperature analyses over Alaska show the same phenomenon extends through all of North America.

Other studies on the unurbanized U.S. data show nighttime temperatures are rising relative to daytime readings. And I would like to show you this because it really is quite remarkable. The graph is from Tom Karl, certainly the premier historian of North American climate. It shows mean daily high temperatures expressed on an annual basis back to 1895. There is, in fact, an increase that occurs in the beginning of the 20th century followed in this case by a decrease. One of the peculiarities that seems to be little known is that averaged across the United States, mean daily high temperatures are now running at or close to the lowest value that they have for the last 100 years.

Now, I want to compare that to low temperatures. Low temperatures show the same rise in the early 20th century, but they do not then fall. In fact, what we have is a situation where the nighttime temperatures are rising relative to the daytime temperatures. If we subtract one from the other, we get this curve published by Tom Karl which shows a drastic decline in the daily range of temperature. This is not unlike what one would expect in a greenhouse world.

The only problem with that is that if trends such as this continued, the greenhouse world would be nowhere near its popular perception. The greenhouse world would have longer growing seasons, more precipitation and less skin cancer, everything else being equal, because there are records of increased cloudiness, and more plant growth because of the well-known effect of carbon dioxide fertilization.

Senator, I don't necessarily believe that. That positive vision of future climate was recently presented by Soviet academician Mikhail Budyko. Budyko is a renowned climatologist whose position is roughly analogous to being in the highest echelons of our own national center for atmospheric research.

Finally, I would like to touch upon the problem of the temperature histories themselves. In the latest issue of the Bulletin of the American Meteorological Society, Karl compares NASA climate records over the United States to those he has removed the urban effect. This is a very insidious effect to remove. And I will show you what happens when we subtract one from the other.

Karl found that when we take out the urban effect from NASA's record over the United States, that record, the NASA record has an artificial warming in it of .7 of a degree Fahrenheit in the 20th century, again compared to the unurbanized record. If that applied globally—and we don't know whether it does or not because the research simply has not been done—the remaining warming of the 20th century would be less than one-half a degree Fahrenheit. That amount is three times—and I underscore times—less than that predicted by the average of our climate models after we allow for oceanic heat storage.

This story is unfortunately not over. The last I have heard on this disparity—the disparity between the NASA and Tom Karl's findings—is that it results in part from a programming error when NASA supplied the data for analysis. Its ultimately reality, therefore, remains unclear.

My observations are not intended to minimize the importance of the climate change problem. I share the opinion of probably everyone in this room that it is potentially the most important environmental disturbance ever created by man. Nonetheless, I find it risky to enact sweeping environmental policy based upon visions that are at best clouded and at worst failing. If a failed analysis serves as the linchpin for an otherwise rational energy policy, that policy can suffer a loss of credibility sufficient to set back progress on these important issues for decades. By supporting the important research required to clarify our vision, you can help prevent that unmitigated tragedy.

I will close with a quote from my extended testimony from of Dr. Reid Bryson of the University of Wisconsin. Dr. Bryson founded the world renowned Institute for Environmental Studies there. I think it is fair to say he is a Wisconsin environmentalist in the tradition of others such as John Muir, Aldo Leopold, and Gaylord Nelson. This quotation comes from what will be the next issue of the scientific journal, *Environmental Conservation*.

A warming of the Earth by the suggested amount would be very significant. I do not think, however, that the state of the climatic modelling is sufficiently advanced to make statements about whether it will take place, or even if it does, by how much the Earth will warm. A warming may occur but much more work must be done before we can accept the forecasts for the next century, based upon carbon dioxide doubling, as a basis for action.

Thank you, Senator.

[The prepared statement of Dr. Michaels follows:]

PREPARED STATEMENT OF PATRICK J. MICHAELS

I would like to thank the Foreign Relations Committee for inviting my testimony on the issue of anthropogenerated climatic change.

One thing I have learned after some experience in the atmospheric science business is how easy it is to make a forecast, and how hard it is to be correct. It is in that humbling light that I tender my views on this issue, known popularly as "global warming" or the "greenhouse effect".

100 years ago internal combustion engines had just been invented. A person with rational vision might have said that it would gradually replace the horse. But no one would have believed him if he said that in the next 100 years people would routinely fly

through the air at 600mph over cornfields yielding 150 bushels per acre.

As I testify, there is mounting evidence that the energy of nuclear fusion may be harnessed in a device that is about as complicated as an electrified aquarium. If this is indeed true, technological changes over the next 100 years will dwarf those of the last century by orders of magnitude.

It is in that context that we attempt to steer not only our own environmental policy, but that of other sovereign nations. Nonetheless, news and editorial stories state that evidence is sufficiently compelling for the U.S. to now factor anthropogenerated global warming into the domestic and foreign policy matrix. The tenor of these pieces that while there are some areas of disagreement or inconsistencies in our current understanding, it is high time for sweeping proaction. The political climate is surely so disturbed that some type of drastic action, which some say will entail a virtual restructuring of our way of life, seems inevitable.

My purpose here is not to throw roadblocks in the way of sensible environmental policy. In fact, I have no quarrel with aspects of proposed legislation that emphasize the uncertainties related to this problem and propose an expanded research effort. My purpose is rather to underscore that policy should be commensurate with the state of scientific knowledge. That state of knowledge suffers from a number of important inconsistencies that have appeared in both our analyses of past temperatures and in our forecasts of the future.

Concrete policy cannot require "perfect" science, because such a thing will likely never exist. However, with the great uncertainty that surrounds the climate change problem, I agree with Lind and Scheraga that policy makers should pursue a portfolio of options that will pay off in different future states. Under that rubric, one of the options is that no action other than accelerated research is the optimum policy.

Why that may indeed be desirable at this point is because of the ferment surrounding the entire problem of anthropogenerated climatic change. I liken the current situation to the context of The Structure of Scientific Revolutions by the great historian of science Thomas Kuhn.

Kuhn's thesis is that the normal activity of most scientists is to reverify an already accepted paradigm. A relatively small handful of individuals, who are usually unpopular with their colleagues, exploit what may appear at first to be minor inconsistencies in the global view of a certain problem. After an extended period of turmoil, the old paradigm is abandoned and replaced with a new view. The transition from Newtonian to relativistic physics is a classic example of this process on a large scale; it also happens regularly on smaller scales in less expansive disciplines.

I have speculated in the refereed scientific literature that such a revolution may indeed be occurring in the global warming issue, if we assume that the popular perception of corn belt desertification and tidal waves crashing through a Manhattan landscaped with palm trees--so vividly portrayed in Time Magazine's Object of the Year issue--is the accepted paradigm.

The balance of this report explains my reasons for that thesis.

Carbon dioxide, an effective absorber of infrared radiation, is increasing exponentially in the atmosphere as a result of man's activities. First measurements from Hawaii found concentrations of 315 parts million (ppm) in the late 1950's, while today's concentrations are nearly 350ppm. In the early 1980's, the "preindustrial" background concentration was estimated at 295ppm, giving an increase of 19% since the beginning of widespread thermometric records.

If the earth had come to immediate thermal equilibrium, that change should have produced a global warming of 1.3° F. Because measured warming was thought to be between 0.7° and 1.3° F, depending upon which record is used, the observed changes initially seemed consonant with anthropogenerated CO₂ increases.

Several findings since then indicate the problem is much more complicated. These include the exponential increases in other thermally-active trace gases, such as methane, nitrogen oxides, and the chloroflourocarbons, and new findings on the geographic distribution of warming and its division between night and day. Also important is recent work on the effect of urban bias on regional temperatures.

1. Changes in trace-gas concentrations.

Antarctic ice core measurements now place the background CO₂ concentration between 260 and 280 ppm. If we use the midpoint, the expected equilibrium warming would be 2.0° F.

Other thermally active trace gases have also been increasing exponentially, in particular, methane, nitrogen oxides, and the chloroflourocarbons. The combined effect of these should be equivalent to an additional effective increase of 57ppm. Thus, if all of the other radiatively active gases were expressed as if they were CO₂, the concentration of carbon dioxide would be 407ppm, or 151% of a background of 270ppm.

Under equilibrium conditions, the earth should have already warmed 3.6° F from these combined human alterations of the atmosphere. If the lower limit background of 260ppm is used, the expected mean global warming is slightly higher.

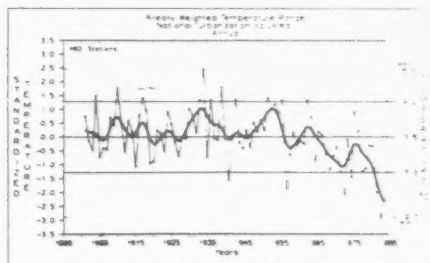
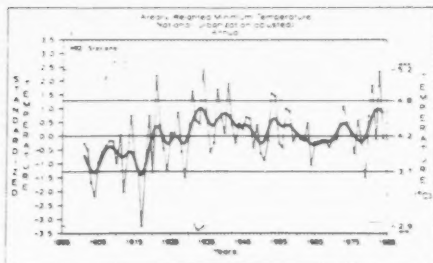
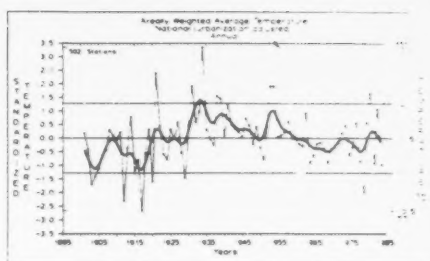
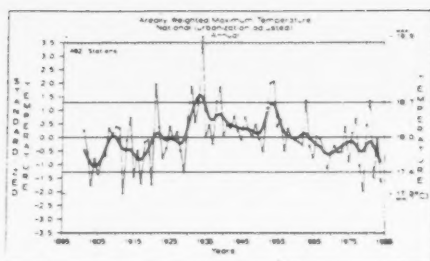
2. The Diurnal Problem

Work by Tom Karl and others from NOAA provide an additional layer of complexity on the climate change problem.

Careful analyses of the unurbanized Historical Climate Network data indicate that daily temperature ranges over the United States are declining since the significant addition of trace gases. In particular, it appears that night minimum temperatures are rising relative to daytime maxima. The implication is that the greenhouse effect could be expressing itself primarily as a rise in the nighttime temperatures, while daytime temperatures have in fact declined.

This could be caused either by increased cloudiness, which has been noted in four reports in the refereed scientific literature, or by the infrared absorbing effects of anthropogenerated trace gases.

The peculiarity is that if such a trend continued, greenhouse world could be one where growing seasons were longer (because nighttime temperatures increased), there was more precipitation and less skin cancer (because of increased cloudiness) and plants grew better (because of the well known effect of carbon dioxide fertilization).



U.S. average temperatures in the urbanization-adjusted Historical Climate Network of Karl *et al.*. UL: Daily Maxima; LL: Daily Minima; UR: Daily Average; LR: Daily Range (Difference between high and low). The decline in daily range occurs because of a relative rise in nighttime temperatures.

Analyses through 1987 show that this trend continues.

The "positive" vision of future climate was recently presented by Soviet Academician Mikhail Budyko, in a paper first read at a NOAA sponsored meeting of the Climate Trends Panel last September. Budyko's position in the Soviet science establishment is roughly analogous to being in the highest echelons of our National Center for Atmospheric Research.

3. The Spatial and Temporal Distribution of Observed Warming

There is an unknown lag effect that occurs because of the oceans. Wigley has calculated, however, that even the most liberal estimates of this lag imply an expected warming of 1.8° F (or 2.2° with the lower background CO₂ of 260ppm). At best, the earth appears to have warmed up only half as much as our average forecasts indicate it should have. A mathematical argument in Dr. Schneider's *Journal Climatic Change* suggested the oceans might mitigate expected surface warming by a factor of three.

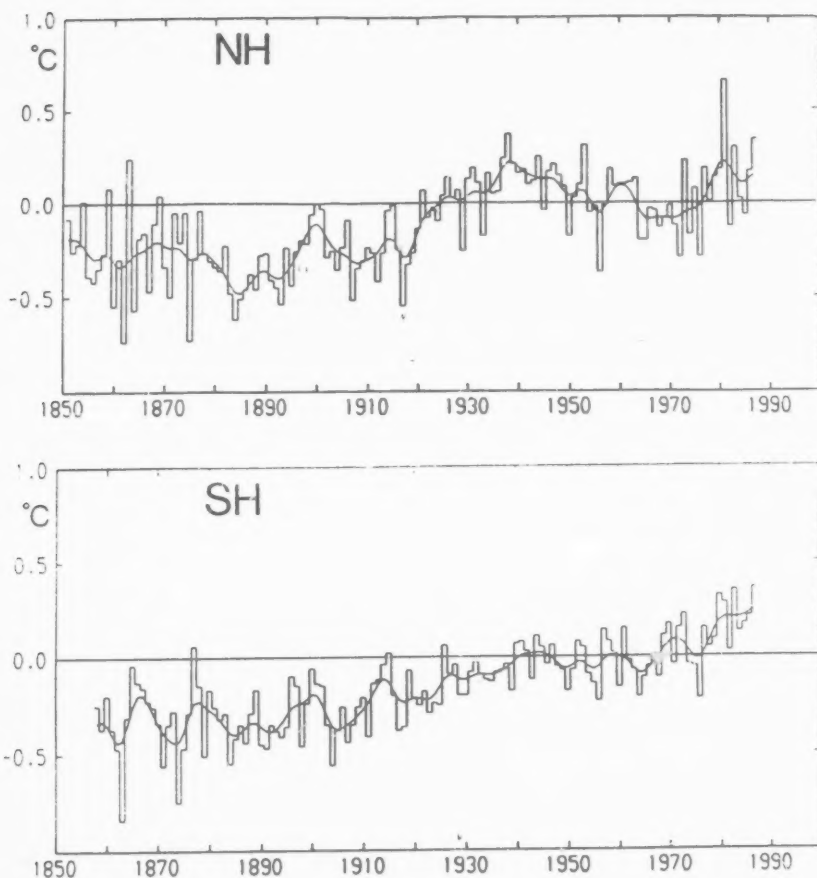
The oceanic lag argument is complicated by the differing behavior of the Earth's hemispheres. Northern hemisphere temperatures show almost all of their increase before the major trace gas emissions. In fact, there is no statistically significant trend for the last 55 years. Hugh Elsaesser, of the Lawrence Laboratory, demonstrated that most of our hemisphere's warming can be ascribed to a period during Woodrow Wilson's presidency.

Southern Hemisphere temperatures display a thermal signal that is much like we would expect in a Greenhouse World--little change through the 1940's, followed by an exponential increase, albeit one of approximately half the magnitude expected even with liberal thermal lag arguments.

Most scientists directly involved with this research problem cite the hemispheric disparity as either counter to or beyond the current pale of our understanding.

4. The Urbanization Problem.

It is well known that long term climate records sometimes warm because their surroundings become more urbanized, and while much has been written on this problem, it remains elusive. In the March, 1989, issue of the Bulletin of the American Meteorological Society, NOAA scientist Tom Karl published a paper that compares NASA climate records over the U.S. to the urbanization-adjusted Historical Climate Network. The paper shows that the NASA record warms up 0.7 F in the twentieth century compared to the unurbanized record. It is important to note that there is no a priori reason to suspect that the urban bias is appreciably different in other portions of the industrialized world. A simple extension to the globe--which is not possible to rigorously defend at this time because the exhaustive research has not been performed--yields a remaining warming of 0.4-0.5, an amount which



Virtually all of the warming in Northern hemisphere temperatures (top) took place prior to the major trace gas emissions; there has been no net warming for the last half century. Southern hemisphere temperatures (bottom) more resemble what we would expect from a greenhouse alteration, except the magnitude of change is too small.

is three times less than that predicted by the average of our sophisticated climate models.

The last I have heard on this disparity is that it resulted in part from a programming error when NASA supplied the data for analysis. Its ultimate reality is therefore unclear.

A different analysis, by Hanson and others, finds virtually no change in continuous U.S. temperatures over the last century, which is consistent with some climate models, in which areas the size of the U.S. can continue to be cooler than the rest of the world for periods of decades. However, analogous studies of Canadian data and my mean layer temperature calculations for Alaska show that indeed the area of no significant temperature change over the last 50 years is virtually all of North America. It is doubtful that this can be accommodated by a climate model with a realistic change in trace gas concentrations in that period.

One peculiarity of that analysis is the unusual lack of variability evident from 1955 through the late 1970's. Since then, we have returned to the average variability of the last 100 years. Because of the perception of the recent past, some erroneously view this as unusual.

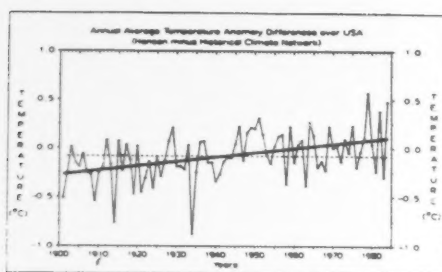
It would be important to extend these types of analyses to other regions with analogous urban/rural climate networks, such as the Soviet Union. I urge that you give what would have to be a joint effort your highest priority. In addition, I urge the support of other important investigations that will help us determine the earth's true temperature history and to find in fact how the change in trace gases will eventually be expressed.

5. Summary and Conclusions

These observations are not intended to minimize the importance of the climate change problem, but rather to emphasize its complexity. I find it risky to enact sweeping environmental policy based upon visions that are at best clouded, and at worst failing. If a failed analysis serves as the linchpin for an otherwise rational energy policy, that policy can suffer a loss of credibility sufficient to set back progress on these important issues for decades. By supporting the important research required to clarify our vision, you can prevent that unmitigated tragedy.

I will finish with a quotation from Dr. Reid Bryson, founder of the world-renowned Institute for Environmental Studies at the University of Wisconsin, from an article to be published in the next issue of the scientific journal Environmental Conservation:

"A warming of the earth by the suggested amount would be very significant. I do not think, however, that the state of climatic modelling is sufficiently advanced to make statements about whether it will take place, or even if it does, by how much the earth will warm. A warming may occur but much more work must be done before we can accept the forecasts for the next century, based upon carbon dioxide doubling, as a basis for action."



NASA's record over the coterminous U.S. warms approximately 0.7° F compared to the urbanization-adjusted historical climate network. If such a trend occurred throughout the rest of the world, net global warming for the 20th century would be 0.4° F, which is virtually indistinguishable from background noise.

The CHAIRMAN. Thank you very much, Dr. Michaels.
Dr. Singer, is there anything you would like to add?

STATEMENT OF DR. S. FRED SINGER, DEPARTMENT OF ENVIRONMENTAL SCIENCES, UNIVERSITY OF VIRGINIA

Dr. SINGER. I want to thank the committee for inviting me.

By way of introducing myself, I have just completed a tour of duty as the chief scientist of the Department of Transportation; at earlier times I have served in policymaking positions in the Environmental Protection Agency and in the Department of the Interior under Russell Train.

I am an atmospheric and space scientist. Among other things, I have invented the ozone meter that is currently used to observe stratospheric ozone from satellites. I was the first director of the U.S. weather satellite program which is now in NOAA.

I also published predictions that methane would increase on a global scale because of human activities. And methane, as you know, has become an important greenhouse gas.

With this preamble, I would like to give you my testimony very briefly.

The CHAIRMAN. If you care to digest it, the full text of any statement will appear in the record as if read.

Dr. SINGER. Thank you.

First of all, science. I do believe in the greenhouse effect, but where is the global warming? You have just heard an excellent exposition of the data from Professor Michaels. Global warming seems to have occurred early in the century, before 1940, when there were hardly any greenhouse gases in the atmosphere. And from 1940 onward for a quarter of a century, temperatures dropped while greenhouse gases soared.

What's going on? How do we explain this? The answer is we cannot as yet explain it scientifically, and this is a worrisome problem.

We speculate that perhaps the greenhouse effect is being offset by an increase in the cloudiness in the Earth's atmosphere, but that is only speculation because we don't have data that can support this.

We do know, for example, that the 1988 drought that Senator Pressler was concerned about was caused by effects that have nothing to do with greenhouse gases. That seems to be generally accepted by scientists.

We also know that we are approaching an ice age before very long. We don't know exactly when it will come, but some of us remember that about 20 years when temperatures were still declining, people were very worried about the coming ice age. I haven't heard much about it during the past year, but it may come back if we have some cold winters.

We will certainly know very soon if the greenhouse effect does produce global warming because according to the theory, you cannot hide it. It must be there, but we don't see it.

This is by way of illustrating the uncertainty of the scientific base and serves, I think, as a warning to go slow, not to panic and be careful.

Let me now talk briefly about the problems with international controls, because this is a subject that this committee needs to be concerned about.

First of all, controlling the emission of carbon dioxide from the burning of fossil fuels means controlling the use of energy. And to most people in the world, this means slowing down or stopping economic growth. People in the Third World view any attempt to slow down their economic growth as a kind of ecological imperialism practiced by the wealthy nations to keep them from reaching parity with us. I don't accept this view myself, but I think I should report it to you. You are, of course, aware of how Third World countries feel about the competition that they are involved in with the developed countries, with the rich countries.

Similarly, the deforestation issue, on which I agree with Russell Train, is viewed by many of the Third World nations as an unwarranted interference with their internal affairs. And they point to us and ask us why we are not stopping the deforestation of the United States, for example, the cutting of virgin timber in our western forests.

Turning from politics to science, I would just like to emphasize that it is extremely difficult to control greenhouse gases other than CO₂. CO₂ is difficult enough. For example, it is hard to visualize putting controls on cows or on rice paddies to control the emission of methane.

Similarly, if we get rid of CFC's, chlorofluorocarbons, which are greenhouse gases, keep in mind that the substitutes are likely to be also greenhouse gases. They might be better or they might be worse.

Also keep in mind that nitrogen oxide, another greenhouse gas, arises from agriculture and from the use of fertilizer. And while we are trying to feed the world by the use of fertilizer, we cannot at the same time be curtailing the emission of nitrogen oxides.

These are some of the problems that you should be aware of.

Finally, let me now talk about what prudent steps we can take. Above all, I want to emphasize that we do have time to take steps. We should be calm. We should not panic. The world is not going to come to an end in the next few months or in the next few years.

The most prudent step that we can take in my view is energy conservation—wherever it is economic, wherever it makes economic sense, regardless of whether we have greenhouse effects or not. The question I always ask is if energy conservation is great, why aren't we doing more of it. Let's find out what the obstacles are and let's overcome them.

Energy conservation, indeed all energy policy, involves proper pricing for energy. And here I agree with Mr. Speth. I am a believer in charging the proper price for the use of resources. And this includes especially transportation fuels like gasoline. We should be paying the cost of our road system out of gasoline taxes rather than out of the general fund, out of income taxes, sales taxes. And thereby, we would also be practicing energy conservation as a by-product of conducting our affairs in a sensible way.

We should also switch to nonfossil fuels wherever it makes economic sense. Wherever solar energy is cheaper than coal, we should use solar energy. Wherever nuclear energy is cheaper than coal, we should use nuclear energy. These are energy sources that are available.

And finally, I would not be true to my own scientific background and education if I did not point to advances in technology. I am a great believer in technology, and we are in for a great many surprises. I remind you that just in the last few weeks we have been reading about the discovery of the cold fusion process which potentially is a virtually inexhaustible form of energy, virtually free of pollution, at least the kind of pollution that we have been talking about here.

But that's not all. We should be thinking about a better internal combustion engine, one that is not only more efficient, but is basically nonpolluting. Such engines can be built. They should be built. We should at least do the research that leads to the construction of such engines.

And finally, there are all sorts of ways of gaining higher efficiency in electric powerplants; they are being explored and will when they come to fruition, bring us closer to our goal of using energy in a more rational way, indeed, of using all resources in a more rational way.

Mr. Chairman, this ends my presentation. I'll be happy to answer questions.

I would like to submit for the record an article entitled "The Science and Politics of Ozone," of stratospheric ozone, an article that I have written for publication in the *National Review*. It explains my position with respect to the global control of chlorofluorocarbons.

[The article of Dr. Singer follows:]

The Science and Politics of Ozone: Hype, Hoax or Hysteria
(by S. Fred Singer, Mar. 31, 1989)

The 123-nation Conference to Save the Ozone Layer, held in London in March 1989, ended with a whimper. The developing nations, principally China and India, were quite unconvinced by the evidence and unwilling to go along with the European Community and the United States in rushing to phase out completely the chlorofluorocarbons (CFCs) and other widely used chemicals. It seems they know better.

It is rumored that Mrs. Thatcher was converted into a global ozone fan by Sir Crispin Tickell, the diplomat turned eco-freak. Lord knows who the President Bush has been listening to, but he deserves better advice.

Now it's on to a European conference in the Hague to which Maggie and George have not been invited --tsk, tsk-- and then a follow-up to London in Helsinki in May. All this after the 1985 Vienna Convention, the Montreal Protocol (Sept 1987), Geneva, Toronto, and who knows how many other international gabfests in between. Who can keep track of them? Norway's Prime Minister Mrs. Gro Harlem Brundtland hardly spends time in Oslo anymore. My word! When do these people ever govern?

The hyperactivity this creates in the agencies, mainly in the State Department and EPA, has to be seen to be believed. The congressional Government Accounting Office would have done an investigation and totaled up the thousands of hours and the huge resources spent on this issue -- except for the fact that Congress and its staffs are just as involved. As the Hill folks try to outdo the Administration and the feds dream up new initiatives, things are building up to a fever pitch -- spurred on by lurid stories in the media about the imminent danger. "Arctic Ozone is Poised for a Fall" scream the headlines. "Skin Cancer is on the Rise!"

Is it all hype? Or is it a hoax? And is the hysteria for real? As we'll see later, the scientific basis for the much-touted ozone crisis may be evaporating-- leaving the new breed of geo-eco-politicians high and dry.

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How did we get here? It's a long way from the supersonic transport to the Antarctic "ozone hole". But it all started with the SST, just twenty years ago. The emerging environmental movement scored its first great victory by convincing Congress to cancel the program to build two SST prototypes that would have been tested in the stratosphere. When sonic boom and noise objections didn't bring down the program, the activists discovered the stratospheric ozone layer and the fact that a fleet of 500 planes might have some influence on the ozone content of the upper atmosphere. Most influential was the argument that a reduction in the ozone content would increase the rate of skin cancers. That did it. And the skin cancer scare has been with us ever since, inextricably intertwined with the stratospheric ozone issue.

Throughout these past two decades many truths were uncovered by outstanding and imaginative researchers, but many truths were not revealed to the public -- and quite a few things were propagated that departed from scientific truth. Scientists, by and large, behaved honorably, although egos and ambitions collided with the facts, tempting some to ignore facts. Politicians had no such problems or any hesitation to manipulate science and even scientists. And the media had a field day. Let me give you a personal account of this fascinating history.

SSTs and Ozone

I first got involved in the SST issue in 1970 while serving as a deputy assistant administrator of the EPA. I was asked to take on the additional task of chairing an interagency committee for the Department of Transportation on the environmental effects of the SST. Of course, I had some background in atmospheric physics, having been active in the earliest rocket experiments on the ozone layer, and even invented the instrument that later became the main ozone meter for satellites.

There were many false starts. We knew so little about the upper atmosphere. The ozone problem didn't come up until some time in 1970, as I recall; and then only in the context of the effects of the water vapor from the burning of the SST fuel. It was a year later before we came to realize that the main culprit would be the small component of nitrogen oxides (NOX) created in any combustion process.

The first estimates suggested that some 70% of the ozone would be destroyed by an SST fleet; without the ozone shield, "lethal" ultraviolet radiation would stream down to sea level, and an epidemic of skin cancers would sweep the world. This scare campaign led to the cancelation of the SST project. Of course, the two prototypes --all that was authorized-- wouldn't have caused any noticeable effect; but the SST opponents managed to confuse the issue. England and France went on to build the Concorde -- with no environmental consequences.

Only later was it discovered that there were also natural sources of stratospheric NOX and the SST effect soon fell to 10%. But then laboratory measurements yielded better data for the theory, and by 1978 the effect had actually turned positive: SSTs would add to the ozone! It became slightly negative again after 1980, but by then the SST had been forgotten and all attention concentrated on the effects of CFCs.

Few outside my special field know about these wild gyrations in the theoretical predictions. But those of us who lived through them have developed a certain humility with respect to theoretical predictions -- particularly of atmospheric phenomena.

It's a matter of some irony that current theory predicts that aircraft exhausts counteract the ozone-destroying effects of CFCs! But remember: it's theory, and it could change.

Science is supposed value-free. I learned differently when I conducted a modest survey among my colleagues during the SST controversy. I found that those who opposed SSTs for economic (or less valid) reasons also tended to believe that the environmental effects would be serious. Those who liked the idea of supersonic transportation tended to belittle the ozone effects; they turned out to be right a few years later, but how did they know?

Methane and CFCs

Once Pandora's box had been opened, we all began to look for other ways to affect stratospheric ozone. During my SST tenure I became intrigued by the idea that human-produced (or at least, human-related) methane could affect the stratosphere. Methane is a long-lived gas in the atmosphere, very difficult to destroy. It was thought to be mainly due to natural sources, swamps and things like that. But after thinking about it I found that many important sources are related to human activities: rice paddies, cattle, oil and gas wells, for example.

I reached two conclusions: that about half the methane input is anthropogenic and should therefore increase as population and GNP grow; and that methane can percolate up into the stratosphere, there to be attacked by solar UV radiation, affecting the local chemistry, and eventually adding to the water vapor in the dry stratosphere. To my surprise I found that the methane contribution to water vapor is about as large as that from the hypothetical SST fleet. So never mind the SSTs; mankind is already messing up the stratosphere and has been doing it for a long time.

Public interest in my methane theory was mild, to say the least. The American journal Science turned it down, based on the recommendation of the reviewer -- a good friend, who then called to tell me he did it to uphold my scientific reputation. It was finally published in 1971 in the British journal Nature. But no one got excited about it: stopping cows from belching and other gaseous exhalations didn't ignite the environmental community. Cows are so-- natural and low-tech. Not a great cause. And besides -- controlling their emissions could be messy.

CFCs are different. Brilliant scientific work by Britisher James Lovelock, who developed the methods to measure tiny amounts of CFCs in the atmosphere, and the calculations of Californians Mario Molina and Sherwood Rowland demonstrated in 1974 the possibility that long-lived and normally quite inactive CFCs would percolate up into the stratosphere, and there be decomposed and attack ozone.

The environmentalists' reaction was ecstatic. At last, an industrial chemical-- and produced by big bad DuPont and their ilk. What a cause! What a worthy successor to the SST, now that the issue was dead.

Regulation was not long in coming. By 1975, voluntary restraints were adopted on the use of CFCs in spray cans, an important but noncritical application. By 1978, the United States and some Western nations unilaterally banned CFC use in all aerosol applications.

But that was all for a while. The other applications of CFCs didn't have easy replacements. Substitutes hadn't been developed; and they might turn out to be hazardous, toxic or expensive -- and perhaps all of the above. Besides, replacing refrigerators, air conditioners, plastic foam blowers, and electronic cleaning equipment loomed as an expensive undertaking. Most Europeans and the Japanese were not interested in joining any global agreement, and any further unilateral action by the U.S. wouldn't have been very effective globally.

On top of all this, the data from the labs and computers were reducing the threat. A National Academy of Sciences study in 1980 predicted a 18% ozone decrease, based on a certain standard CFC scenario. By 1982 the effect had decreased to 7%, by 1984 to 2-4%. Ironically, much of the reduction was due to the discovery of the counteracting effects of other pollutants: methane, nitrogen oxides, and carbon dioxide. So-- putting these polluting gases into the atmosphere hastens the arrival of global warming by the greenhouse effect while reducing the destruction of ozone.

Then along came the Antarctic "ozone hole".

The Antarctic Ozone Hole (AOH)

In 1985, a British group operating an ozone observing station at

Halley Bay, Antarctica, published a result that came out of the blue. Beginning around 1975, every October, they observed a short-lived decline in the amount of stratospheric ozone. The amplitude of the decrease had grown steadily, reaching nearly 50% of the total ozone. The finding was quickly confirmed by satellite instruments, which also indicated that the phenomenon covered a large geographic region.

The "smoking gun" had been found--so it seemed. CFCs were immediately suspected; and indeed, chlorine compounds were observed in the region of ozone destruction. The process itself was a new one and had not been studied before; it involved the presence of ice clouds that formed in the polar winter in the coldest region of the earth's atmosphere. The growth of the hole was "obviously" connected to the rise in the atmospheric CFC concentration; and it seemed only a matter of time before the hole would expand and "swallow us all"-- or at least all the world's ozone.

The AOH was a smashing success with the anti-CFC crowd and put new life into them. Dropping their earlier opposition the industry rolled over and played dead, and finally joined the environmental activists. It may have dawned on them that with demand rising and supply limited or even declining, prices and profits could grow nicely. Those with safe substitutes might even gain market share and keep out competitors. In the government, the strong push came from EPA and State, where mid-level bureaucrats fashioned a steamroller that pushed the White House to propose, as a compromise, a CFC production freeze, followed by a rollback to 50%. That was the upshot of the 1987 Montreal Protocol, carefully prepared by the Vienna Convention and many other international meetings.

But some things didn't quite fit. I was puzzled by the sudden onset of the AOH in 1975. It suggested some kind of a trigger, unlikely to come from the steady increase of CFC content of the atmosphere. What could it be? A climate fluctuation that cooled the stratosphere enough so that the ice crystals would form? But if a fluctuation, then the hole could disappear if the fluctuation went the other way. Or -- the AOH might have existed before. I sent a Letter to the editor of Science suggesting this --no luck. So, in Nov 1988, I finally published a short note in Eos, the house journal of the American Geophysical Union, the major professional society in this field.

The Skin Cancer Issue

Meanwhile, the hype was deafening. I remember one Congressional hearing in 1987--there were so many-- where the witness was a noted dermatologist. He explained that since the hole had grown, since 1975, malignant melanoma had increased nearly 100% -- a frightening but true statistic. He simply did not explain three other facts to the Congress or to the media:

- o An Antarctic hole should have no effect whatsoever on cancer rates in the U.S.

- o In any case, melanomas have not been related directly to increased UV exposure.

- o And finally, melanoma rates have been increasing by about 800% since statistics were first collected in 1935! There has been no corresponding change in the ozone layer or in the UV reaching sea level. To the contrary, measurements of UV-B (the biologically active component) have shown a pronounced and steady decline at every location; UV intensities in American cities are less today than in 1974. The causes of melanoma must include more than UV.

There does exist a correlation between UV-B intensity and benign skin tumors. Their frequency clearly increases as one approaches the equator, where the sun and the UV are both stronger, with tumor incidence more than doubling between the northern U.S. and south Texas. But we should not assume that all the increase is just due to UV intensities. Life styles in warmer climates are conducive to greater and longer exposures and may therefore contribute as much or more to skin tumors than the UV values themselves.

One other fact they don't much talk about: Since ozone content decreases strongly in moving towards the equator, a 5% decrease in the ozone layer, as calculated by some of the more pessimistic scenarios, would increase UV exposure to the same extent as moving about 60 miles south, the distance from New York to Trenton or from Palm Beach to Miami. An increase in altitude of 1000 feet would produce the same result.

Global Ozone Trends

The latest phase in the war against the CFCs came in March 1988 when the NASA Ozone Trends Panel announced its findings, after a massive re-analysis of data from ground stations and satellites. After subtracting all the natural variations they could think of -- some of them as large as 50% within a few months at a given station -- they extracted a statistical decrease of 0.2% per year over the last 17 years. Making these corrections is very difficult and very technical and very uncertain -- especially when the natural variations are a hundred times larger than the steady change.

Furthermore, there is the matter of choosing the time period of study, its beginning and end. When people ask me whether the climate is getting warmer or colder, I generally just answer "yes". It all depends over what time scale we average. If the time scale is a few months, then the answer in the spring would of course be "warmer" and in the fall "colder". Now 17 years is only 1½ solar cycles; and solar cycles have a very strong influence on ozone content. Another letter to Science-- not accepted.

The Panel announced its result with great fanfare, an "executive summary", and a press conference --but no publication (as yet) that would allow an independent check of their analysis. One thing stands out from their announcement: the trend found is greater than calculated from the theory. Now this could mean that the theory is wrong, or the trend they found, or both. But the Panel's conclusion was different: the trend is "worse than expected", and therefore CFCs must be phased out completely and more quickly. The logic of this conclusion escapes me, but this has now become the U.S. position. Can you blame the Chinese and Indians for not going along with it?

The Politics of Ozone

It's not difficult to understand some of the motivations. For scientists: recognition for keeping dusty records or running complicated computer models that are rather dull; more grants for research; press conferences; and newspaper stories. Also the feeling that maybe they are saving the world for future generations. For bureaucrats the rewards are obvious. For diplomats there are negotiations, initialing of agreements, and -- the ultimate -- ratification of treaties. It doesn't really

much matter what the treaty is about, but it helps if it supports "good things". For all involved there is of course travel to pleasant places, good hotels, international fellowship, and more. It's certainly not a zero sum game.

I have left environmental activists to the last. There are well-intentioned individuals who are sincerely concerned about what they perceive as a critical danger to the health of future generations. Many of the professionals share the same incentives as government bureaucrats: status, salaries, perks and power. And then there are probably those with hidden agenda of their own -- not just to "save the environment" but to change our economic system. The telltale signs are the attack on free enterprise, the corporation, the profit motive, the new technologies. Some are socialists, some are Luddites.

Most of these "compulsive utopians" have a great desire to regulate -- on as large a scale as possible. To them global regulation is the "holy grail". That's what makes the CFC-ozone issue so attractive to them. And it showed tellingly at the Hague conference in March 1989 -- the one the U.S. was not invited to. You can see why. These world environmental leaders actually proposed a new U.N. agency, aptly named "Globe". Globe was supposed to invoke and enforce sanctions on nations that didn't buckle under to the environmental dictates of those who knew better. Wow! Globe didn't fly--this time round.

Here is David Doniger, senior attorney for the activist Natural Resources Defense Council, writing in the National Academy's Issues in Science and Technology in 1988: " [the CFC Protocol] serves as a precedent for ... carbon dioxide and a dozen other trace gases". So that's what they are headed for. Doniger fairly chortles when he recounts how "hardliners" and "antiregulatory elements" in the White House fought a losing battle against tough control of CFCs because they "seemed either to disbelieve the scientific evidence of ozone depletion or to belittle its consequences."

The CFC-Ozone Theory Revisited

As one of those hardliners I need to explain where I stand and why I am unrepentant in considering extreme controls on CFCs as premature. I tried to explain all this in a Letter to the Editor of Issues, but he turned it down. Twice, in fact. So much for open discussion of important scientific and public policy issues.

I am not against CFC control at all; but look at the poor state of the scientific evidence. The case against CFCs is based on a theory of ozone depletion, plausible but quite incomplete-- and certainly not reliable in its quantitative predictions. Doniger himself does a good job of undermining the credibility of the theory--his only "witness for the prosecution". In his own words:

- o "Current models for predicting ozone depletion are inadequate"

- o " A National Academy of Sciences [NAS] report... quickly became outdated because of new scientific information"

He neglects to inform us that the NAS results have varied all over the place, predicting 18% ozone depletion in their 1979 report, 7% in 1982, and 2 to 4% in 1984. To make matters worse for Doniger's case, evidence is firming up that volcanoes, and perhaps salt spray from the oceans, contribute substantially to stratospheric pollution, and thus dilute the effects of CFCs.

New scientific results, from the laboratory and stratosphere, are pouring in constantly; the theory has been in a state of flux and is bound to change. A major advance, just during the past year, was the recognition that "heterogenous" reactions on stratospheric ice particles play a dominant role in the ozone destruction process; but we don't yet know the crucial reaction rates or even some of the basic scientific facts.

Having impugned the CFC-ozone theory -- the only basis for making predictions -- Doniger nevertheless insists on immediate draconian measures to control CFC production. Not content with a temporary freeze or a roll-back, he argues for a complete phase-out of CFCs -- without waiting for better scientific data.

The Antarctic Ozone Hole (AOH) Revisited

The standard CFC-ozone theory did not predict the ozone hole, the temporary thinning of the stratospheric ozone layer in the Antarctic; now can it account for its future course. The prevailing view is that the AOH first arose, quite unexpectedly, in 1975 and grew rapidly thereafter, as a direct result of the increasing release of CFCs into the atmosphere. According to recent reports, the same phenomenon is just about to happen in the Arctic -- and by implication, all over the globe. That's a scary thought -- and it has made a great impact on the public as well as on governments. It probably was the main impetus for the Montreal Protocol.

This sudden growth of the AOH may, however, simply signal the presence of a triggering mechanism that has nothing to do with the steady increase in CFC concentration. Under this hypothesis, the AOH would not continue to grow as CFCs build up, and could even be ephemeral. Furthermore, any reasonable changes in CFC concentration should not have much impact-- as long as there was some minimum level of stratospheric chlorine, derived from any of the many natural and manmade sources.

In reaction to my suggestion published in Eos, Professor Marcel Nicolet, a distinguished Belgian atmospheric physicist, has now reminded us in a note to the same journal of a long-forgotten publication by G.M.B. Dobson, the Oxford professor who started modern ozone observations. Dobson recounts that when the Halley Bay Antarctic station was first set up in 1956, the monthly telegrams showed that "the values in September and October 1956 were about 150 [Dobson] units [50%] lower than expected.... In November the ozone values suddenly jumped up to those expected... It was not until a year later, when the same type of annual variation was repeated, that we realized that the early results were indeed correct and that Halley Bay showed most interesting difference from other parts of the world."

This remarkable quote clearly indicates that meteorological factors influence, and may even control, what happens to ozone in the Antarctic. The AOH may now wax and wane; it may even disappear and re-appear regardless of the actual level of CFCs in the atmosphere. The theory is not yet able to predict the future course of the AOH and interesting scientific questions remain.

The Global Ozone Decrease Revisited

As noted earlier, the Ozone Trends Panel (OTP) of NASA announced the existence of a declining global ozone trend in March 1988,

accompanied by a press release and executive summary; the full report giving the underlying analysis has not yet been released for general review. Yet much political action has already been initiated on the basis of the announcement. For example, Western nations, principally the U.K., are pushing to tighten the Montreal Protocol by completely phasing out most CFCs, the alleged cause of the ozone decline, instead of just freezing and gradually rolling back CFC production to 50% as agreed to in the Protocol.

While the OTP Report itself is not available, a parallel report from the Center for Applied Mathematics of Allied-Signal, Inc. was distributed at a UN Ozone Science Meeting at the Hague in October 1988. The Allied study deals with many of the corrections necessary to establish a believable trend. The estimated change in total ozone over the 17 years 1970-86 is somewhat less than the OTP result. But the change shows a surprisingly strong dependence on the choice of time period. A simple explanation may be that the 1970-86 period covers only 1½ solar cycles and includes two solar flux decreases vs. only one increase, i.e. two decreasing ozone trends and one period of increase. Thus the reported global ozone decline may just be an artifact of the analysis procedure.

On the other hand, if the ozone trend is real, then there are several possible explanations:

- o CFCs are indeed lowering the average concentration

- o Human-related factors other than CFCs are decreasing ozone levels. One such factor could be methane, as mentioned earlier. Another could be commercial jet aircraft that are increasingly penetrating the lower stratosphere. But current theory does not envisage ozone destruction from this source.

- o Natural effects related to solar cycles may be responsible for an observed ozone decline. For example, the decline in strength of the solar cycle after 1958 could lead to an ozone decline. This last observation leads to an interesting aside. Solar cycles have varied greatly. In recent times, sunspot numbers have been as low as 40 (in 1817) and as high as 190 (in 1958) at the peak of the cycle. During the Maunder Minimum (1645-1715) sunspots were essentially absent. This suggests that there could have been substantial changes in average ozone levels in the past, approximating those feared to result from the release of CFCs. It would be interesting therefore to search the historical records for any biological consequences to humans, agricultural crops, or marine life caused by low ozone levels around 1700.

What to Do?

The current situation can fairly be summarized as follows: The CFC-ozone theory is quite incomplete and cannot as yet be relied on to make predictions. The natural sources of stratospheric ozone have not yet been delineated, theoretically or experimentally. The Antarctic ozone hole is ephemeral; it comes and goes, and seems to be controlled by climatic factors outside of human control rather than by CFCs. The reported decline in global ozone may be an artifact of the analysis. Even if real, its cause may be related to the declining strength of solar activity rather than to CFCs. The steady increase in malignant melanoma has been going for at least 50 years and has nothing to do with ozone or CFCs. And the incidence of ordinary skin tumors has been greatly overstated.

So--the basis for all of the efforts, the negotiations, the Protocol, and all the international conferences is pretty shaky -- to say the least. How poignant! Now may be the time to reflect on the decisive words of immortal Comrade Lenin: "Shto dyelat'-- What to do?"

The regulatory regime for CFCs adopted in the Montreal Protocol is immensely complicated. Enforcing it on a worldwide basis will be a nightmare and involve the use of trade barriers and sanctions confined not only to CFCs but to products manufactured with CFCs--such items as foam plastics and electronic circuit boards that go into computers and TV sets. It will prove to be a contentious issue, particularly since special concessions were given to Third World nations and the USSR. The Common Market operates under a European production cap, which further complicates the situation.

The stakes involved are large. Recent newspaper accounts have EPA predicting a six-fold increase in price, as growing demand for CFCs presses against a limited supply. You can see the struggle for market shares and profits reflected in Doniger's choice of words. When DuPont was fighting the Protocol, they were said to be concerned about "price" [read: profits]; but once they decided to manufacture substitutes, Doniger had them concerned about the "right market incentives". An interesting and contentious question: should DuPont and other chemical manufacturers keep the profits that will be created as a result of governmental regulation?

And substituting for CFCs is no simple matter. A New York Times report of March 7, 1989 talks about the disadvantages of the CFC substitutes. They may be toxic, flammable, and corrosive; and they certainly won't work as well. They'll reduce the energy efficiency of appliances such as refrigerators, and they'll deteriorate, requiring frequent replacement. Nor is this all; about \$135 billion of equipment use CFCs in the U.S. alone, and much of this equipment will have to be replaced or modified to work well with the CFC substitutes. Eventually that will involve 100 million home refrigerators, the air-conditioners in 90 million cars, and the central air-conditioning plants in 100,000 large buildings. Good luck! The total costs haven't really been added up yet.

These are some of the costs we are now trying to impose on the developing countries who can ill afford them. Sanctions through a new U.N. agency seem to be out -- at least for the time being. But trade barriers can accomplish the same results and won't make us beloved. One can hear already the charge of environmental imperialism from third-world countries accusing the West of protecting its pocket books as well as its fair skins. Keep in mind that olive-skinned and dark-skinned people are not very susceptible to skin tumors caused by solar ultraviolet rays.

Of course, if we in the West should be inclined to pay the bill for this major industrial perestroika, then the Asians might just go along. So it's environmental blackmail vs. environmental imperialism. Choosing up sides could prove difficult for some. I'll sit this one out and wait for better and more complete science.

Governments have yet to address what I regard as the real policy issue: How to make decisions about controls on CFC production, and the timing of these controls, in the light of incomplete and often conflicting scientific information. What is needed, it seems to me, is a more complete analysis that weighs the risks to societies stemming from a delay in instituting production controls against the possibility of substantially improving both observations and the theory so that predictions can be relied upon.

At least, when George Bush decided to go along with born-again environmentalist Maggie Thatcher, he qualified his support for a complete CFC phase-out on the availability of safe substitutes. He should have added careful science as another condition.

S. FRED SINGER

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The CHAIRMAN. Thank you very much, indeed. I thank both of you gentlemen.

As you know, the fundamental subject of this hearing was to seek an agenda, what would be the international environmental agenda for the 101st Congress. The previous two witnesses gave some rather specific suggestions.

Do either of you have any specific suggestions as far as an agenda goes?

Dr. MICHAELS. I could perhaps assist the previous two speakers if I would point out that an agenda for action will ultimately fail if those upon whom such action is predicated discover that the science behind it is rather shaky. You will have a very hard time selling a Third World nation very expensive items if they come up and say, "We know that in fact a lot of this warming is not where it is supposed to be and it's taking place maybe at night." We have to find the answers to these things, and then the policy will be defensible.

The worst case is to go to policy and then have it come out over the next 5 to 10 years that, oh, we really didn't need to do that anyway because then you are going to see an anticonservationist movement of major proportion. There will be very little credibility left in the conservation position.

Dr. SINGER. I completely agree with my colleague on the points that he has raised.

I also think that it is very important that the scientific base be reasonably firm before we take drastic actions and before we can sensibly expect to persuade other nations, and especially Third World nations, to go along with us. They are quite sophisticated. Science is an international activity. They read our scientific journals. They are as aware of what is going on in this field as we are. And they will come back to us and we will have a little egg on our faces if we move beyond the range that is backed up by science.

I do have some specific comments on energy policy that back up those that you have heard earlier this morning. As I've mentioned, I have specific ideas on energy conservation, which I feel is an enterprise we should push as far as we can within whatever makes economic sense.

The CHAIRMAN. While you question the idea of global warming, do you also question the thought that the tropical forests are being lessened and that there is a certain loss in biological diversity taking place? Dr. Michaels is saying no, shaking his head.

Dr. MICHAELS. It is patently obvious that deforestation is taking place.

The CHAIRMAN. Right.

Dr. SINGER. I have no special knowledge that qualifies me to be an expert in this field. I am aware of the fact that deforestation is proceeding at a rapid pace. I view it with some alarm. I do not believe that this will change the oxygen balance in the atmosphere as is sometimes claimed; but that is a very specious argument which not many people use anymore—except I see the tropical forests being referred to sometimes as the “lungs of the world.” I don’t think we should use that terminology. Forests are very important for their own sake and for biological diversity, but they have very little to do with the oxygen balance of the Earth’s atmosphere.

Dr. MICHAELS. If I could come back just for a second to that.

The CHAIRMAN. Certainly, Dr. Michaels.

Dr. MICHAELS. There does exist a considerable diversity in the range of estimates as to the rate and degree of deforestation particularly in the Western Hemisphere. And I think that came back to haunt everyone about 10 days ago. I am only getting this from my reading of newspaper stories, but it was my impression that we were told by the Brazilian Government basically in your face, that this is, in fact, our—the Brazilians said the tropical rain forest deforestation was an internal matter. And, in fact, one of the arguments that they based that on was a rather much lower estimate of deforestation than we often hear up in the United States.

That’s why I urge the scientific backing, the hard numbers come out. Otherwise the ball is going to come back in our face again and again and again.

The CHAIRMAN. Well, I appreciate your being here with us. It’s a very interesting argument. It’s a little off the main stream of today’s world, but time will prove either that you are correct or not correct. And I wish you both well.

[Whereupon, at 11:40 a.m., the committee was adjourned, subject to the call of the Chair.]

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